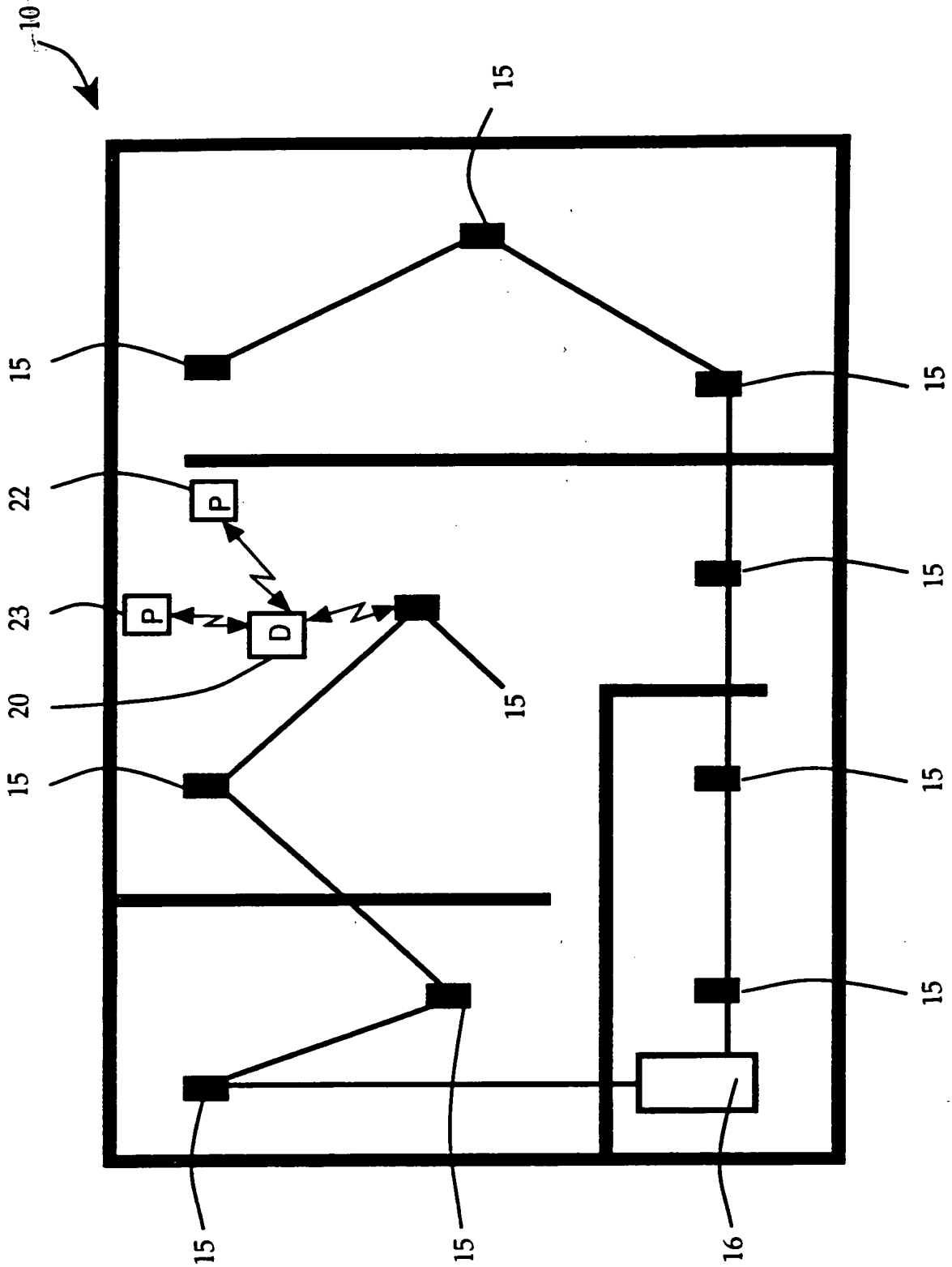


Figure 1A

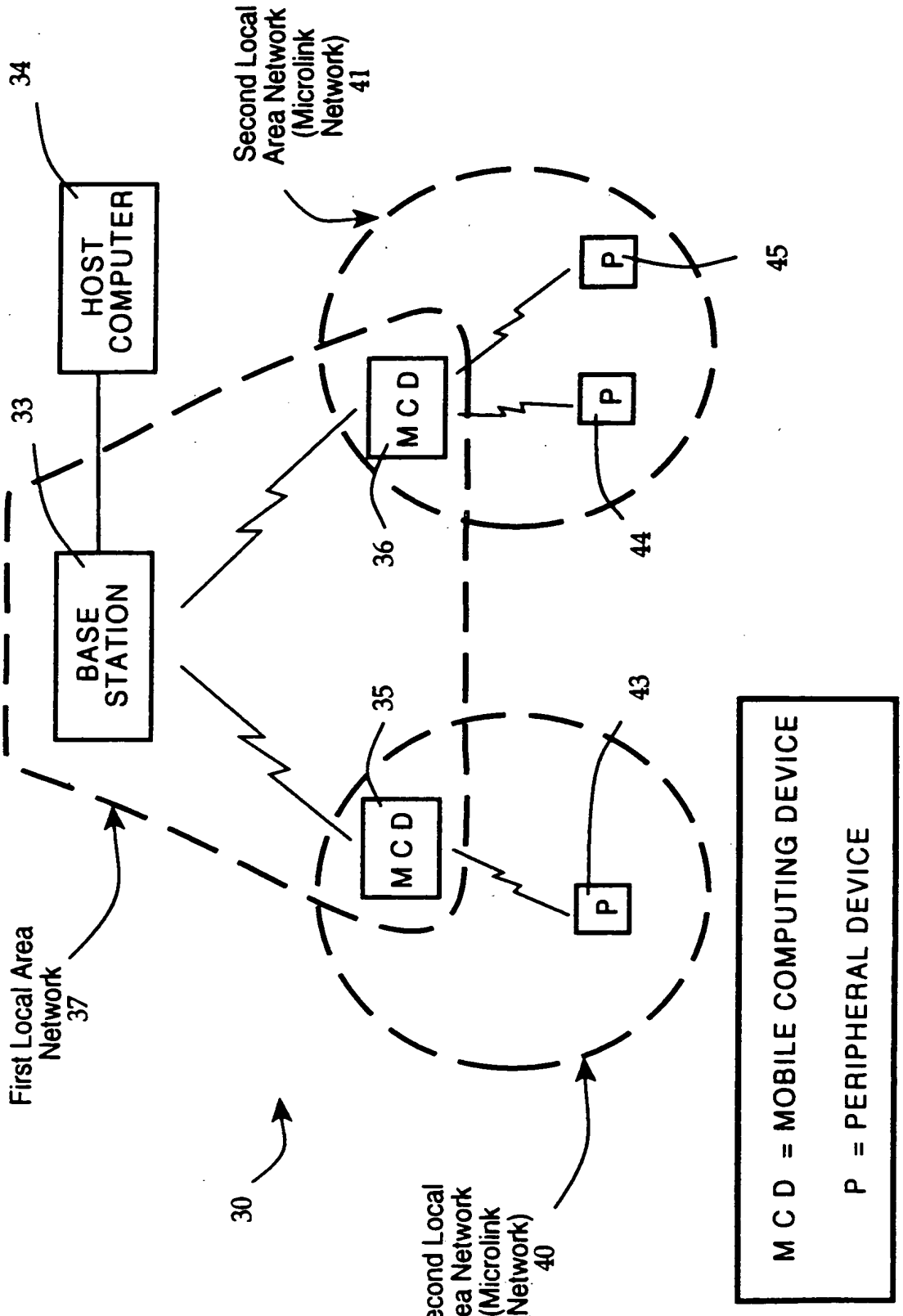

34
HOST COMPUTER
33
BASE STATION
First Local Area Network 37
30
Second Local Area Network (Microlink Network) 41
M C D
36
P
45
44
M C D
35
P
43
Second Local Area Network (Microlink Network) 40
M C D = MOBILE COMPUTING DEVICE
P = PERIPHERAL DEVICE

Figure 1B

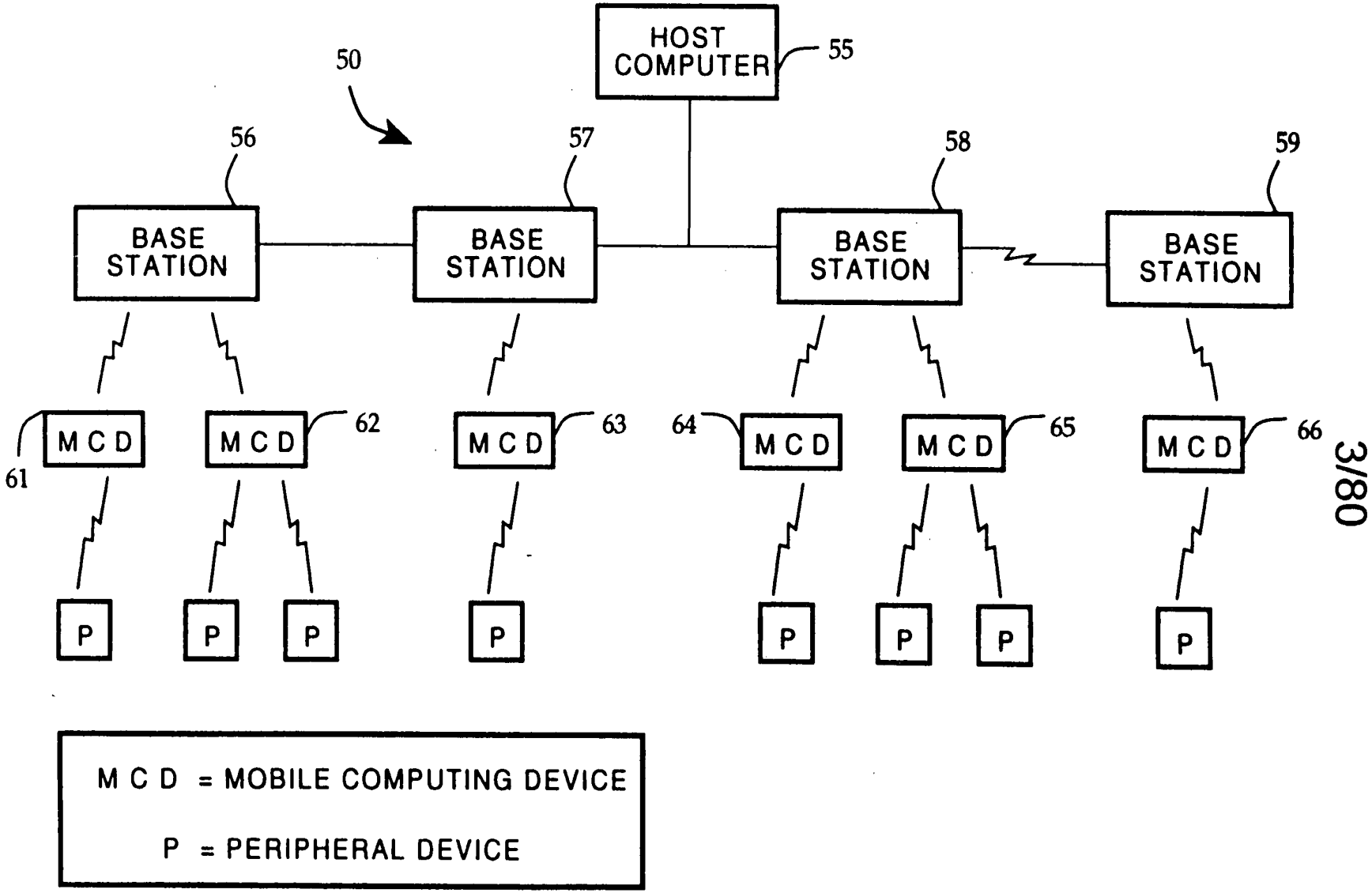

HOST COMPUTER
55
50
56
57
58
59
BASE STATION
BASE STATION
BASE STATION
BASE STATION
MCD
61
MCD
62
MCD
63
MCD
64
MCD
65
MCD
66
P
M C D = MOBILE COMPUTING DEVICE
P = PERIPHERAL DEVICE

Figure 1C

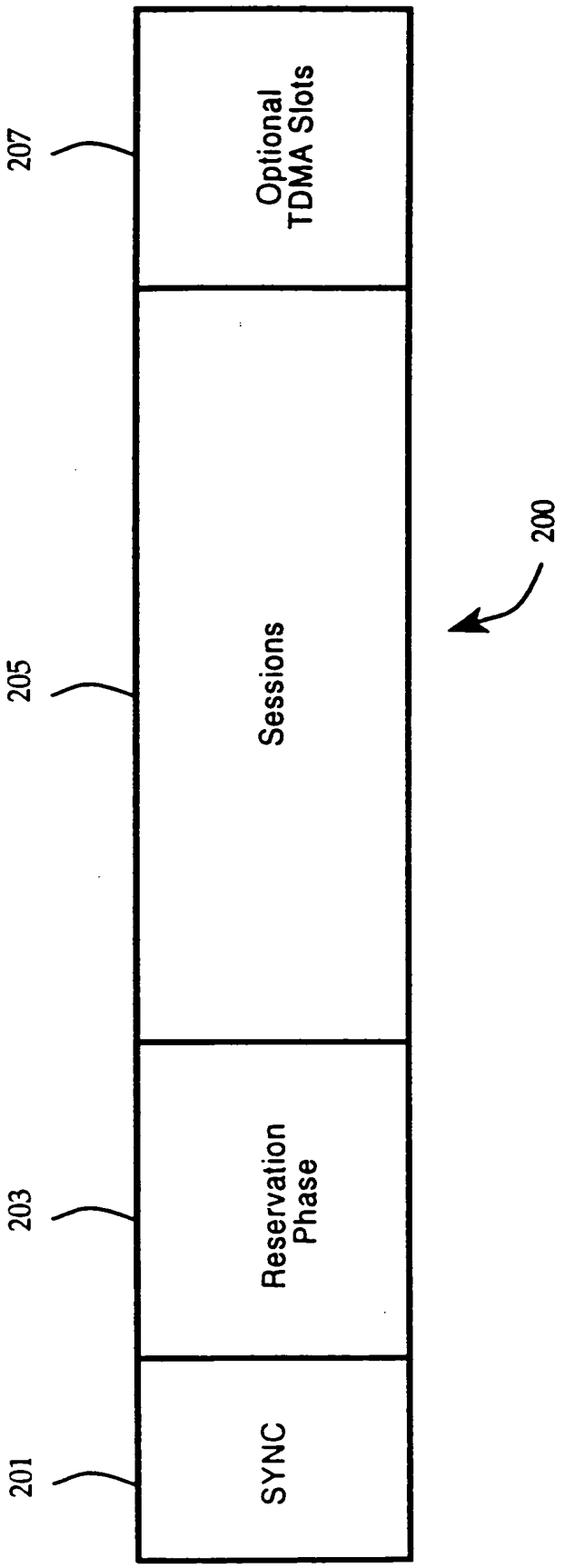

Optional TDMA Slots
207
Sessions
205
200
Reservation Phase
203
SYNC
201

Figure 2

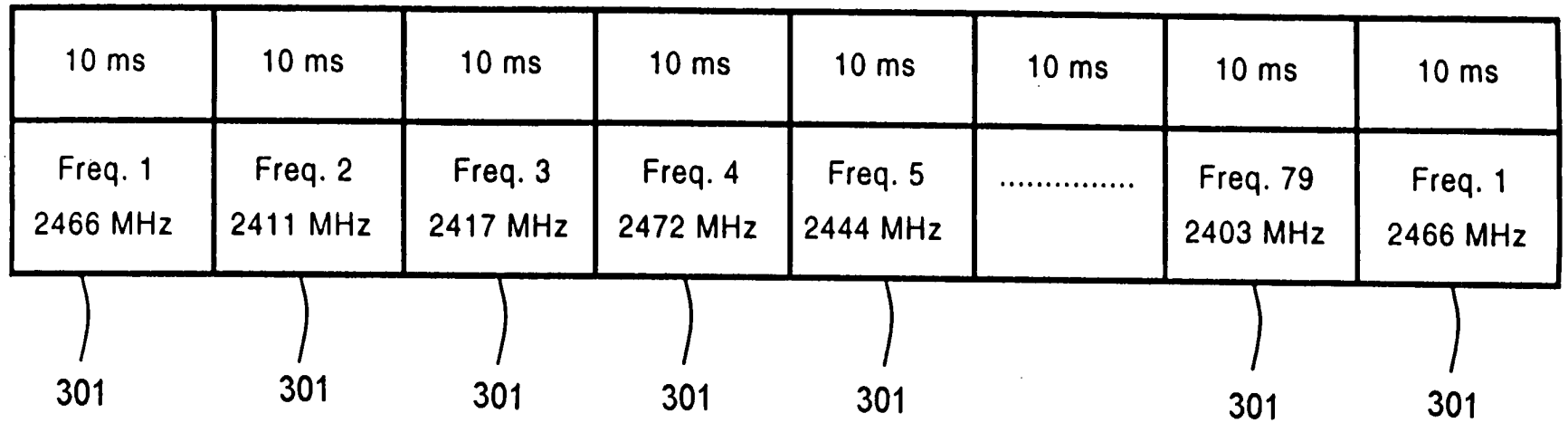


Figure 3A

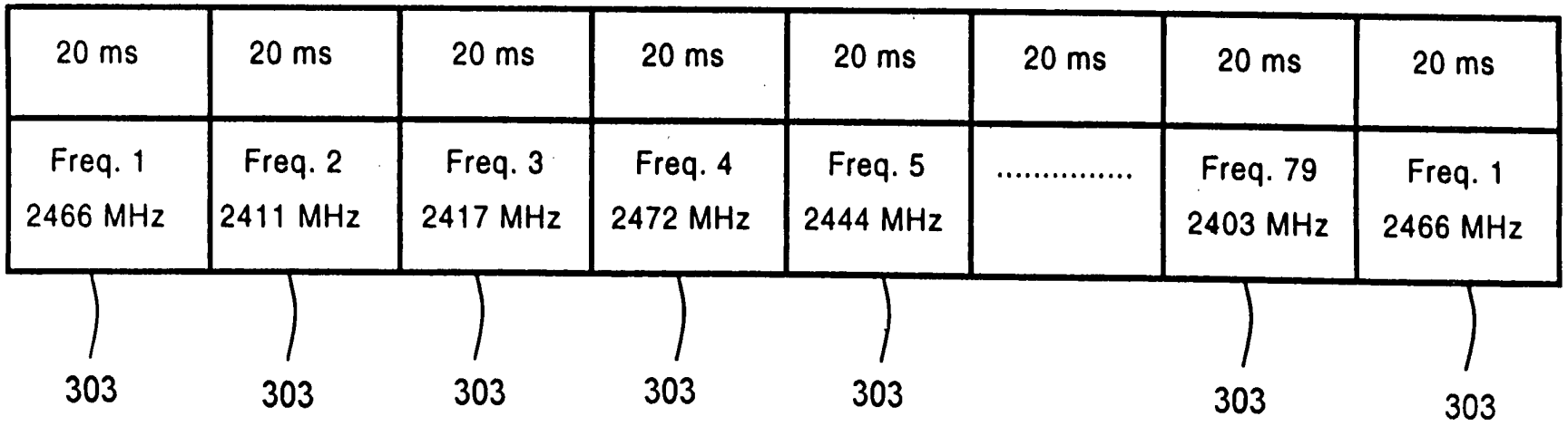


Figure 3B

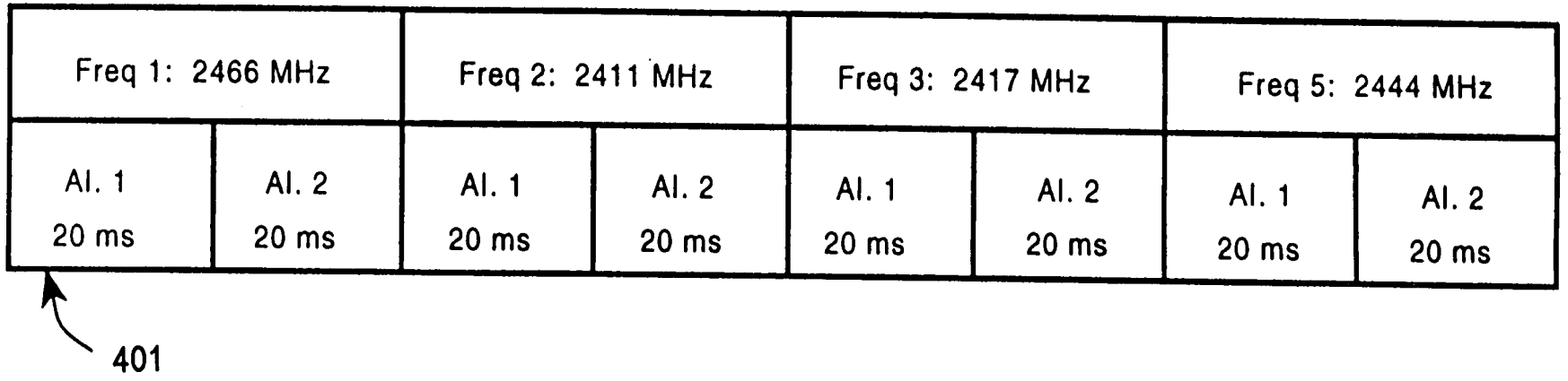


Figure 4A

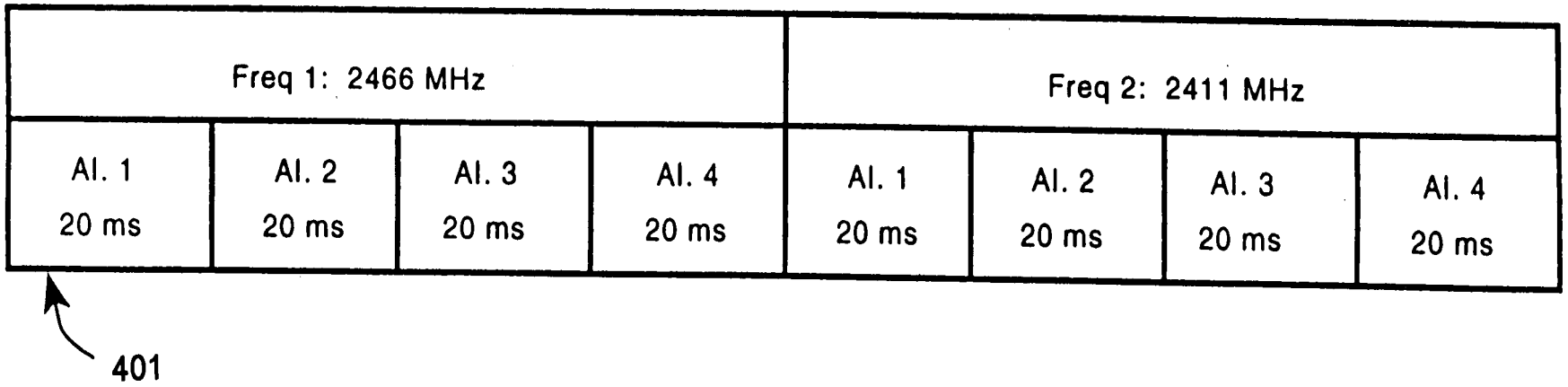


Figure 4B

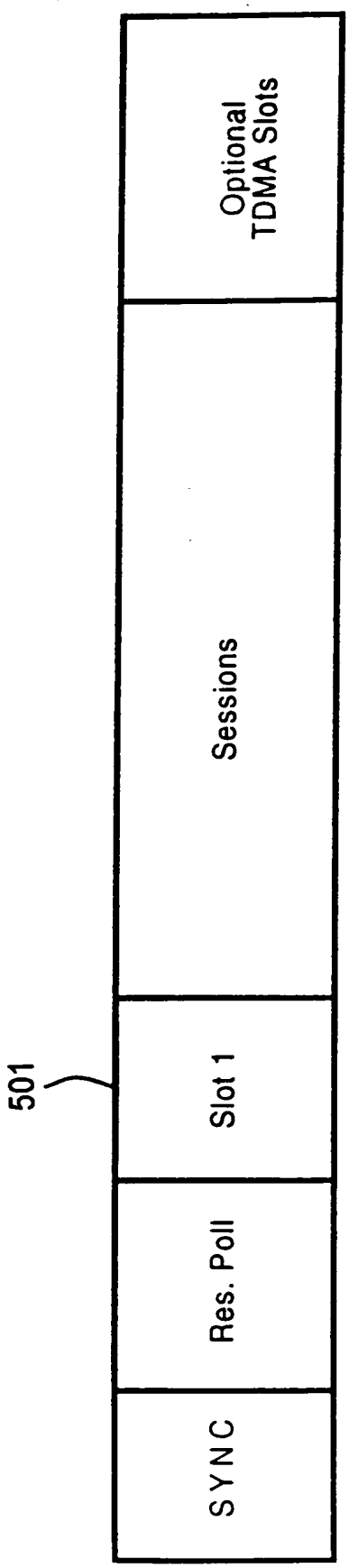


Figure 5A

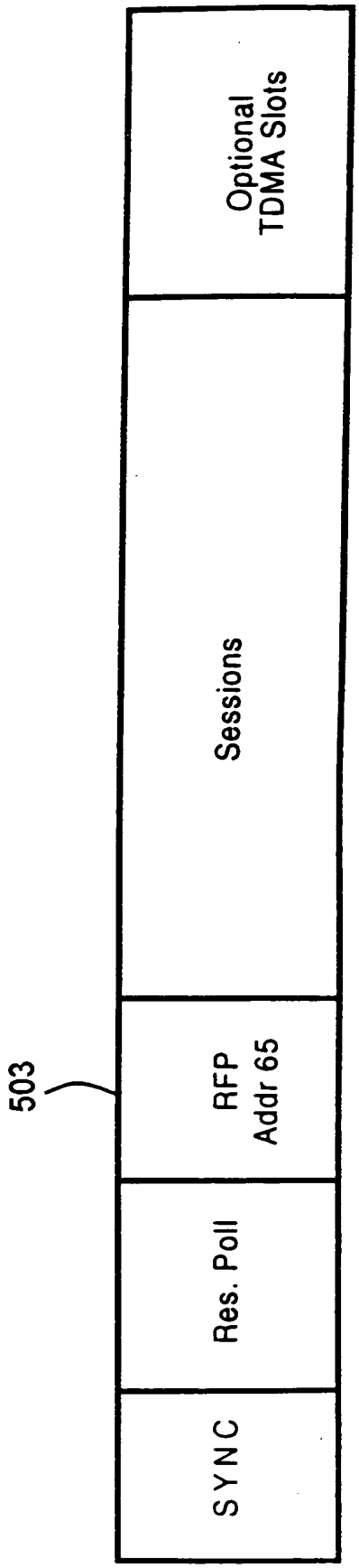


Figure 5B

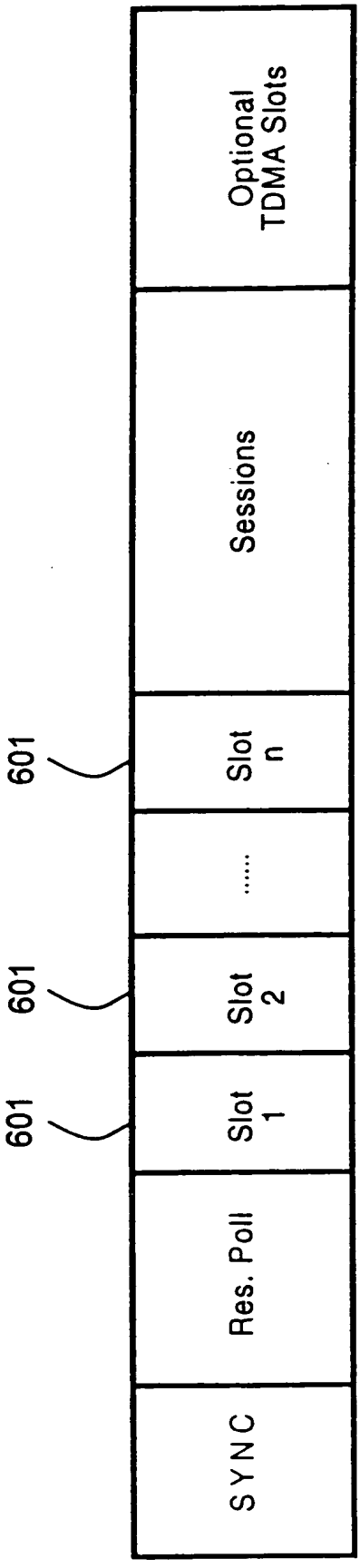


Figure 6A

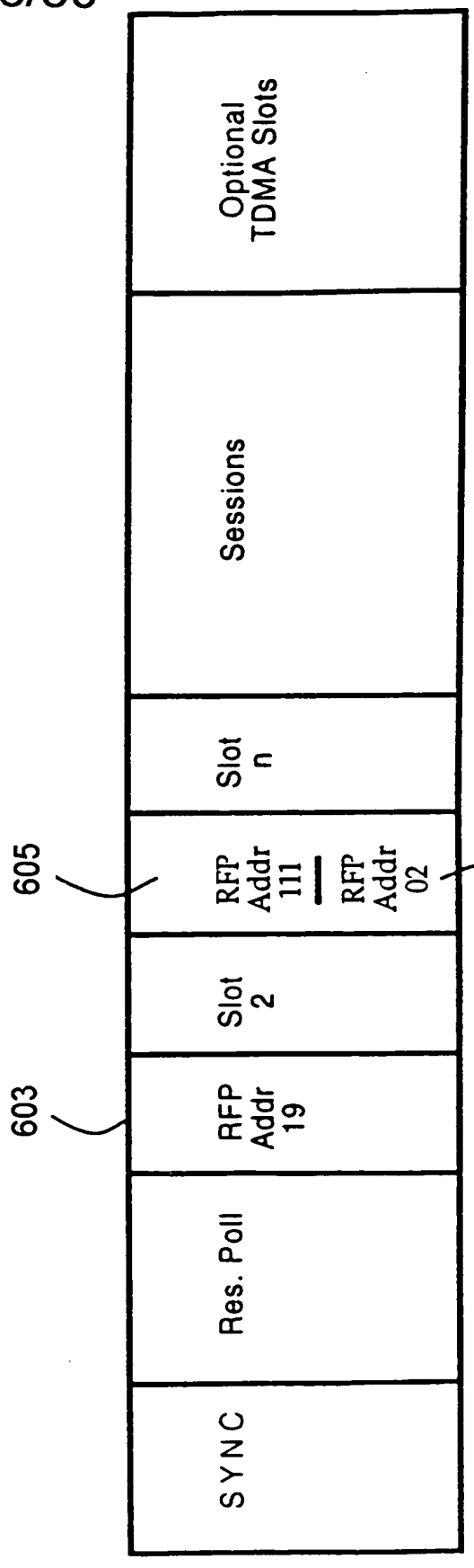


Figure 6B

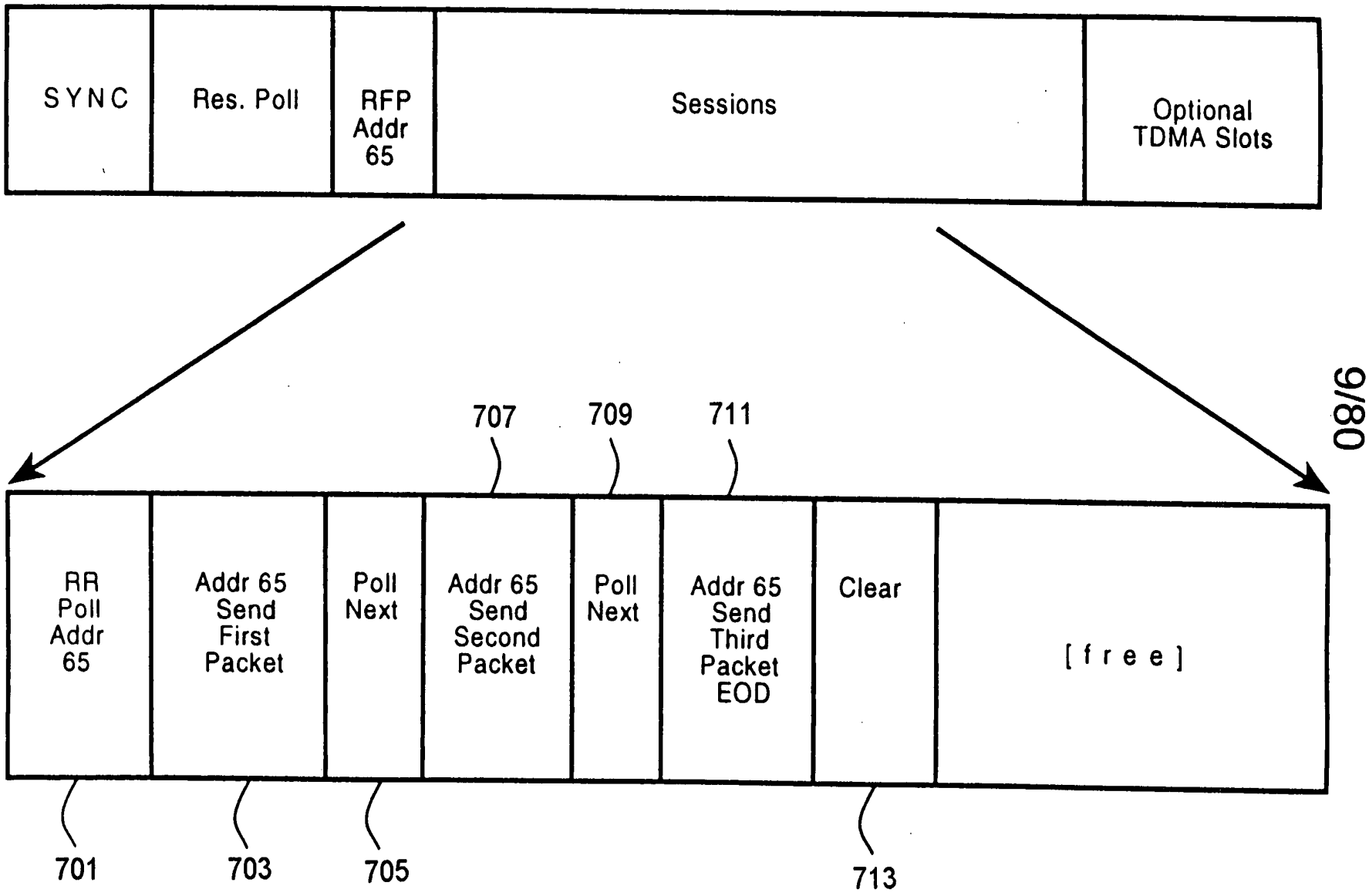

SYNC
Res. Poll
RFP Addr 65
Sessions
Optional TDMA Slots
707
709
711
RR Poll Addr 65
Addr 65 Send First Packet
Poll Next
Addr 65 Send Second Packet
Poll Next
Addr 65 Send Third Packet EOD
Clear
[f r e e]
701
703
705
713

Figure 7A

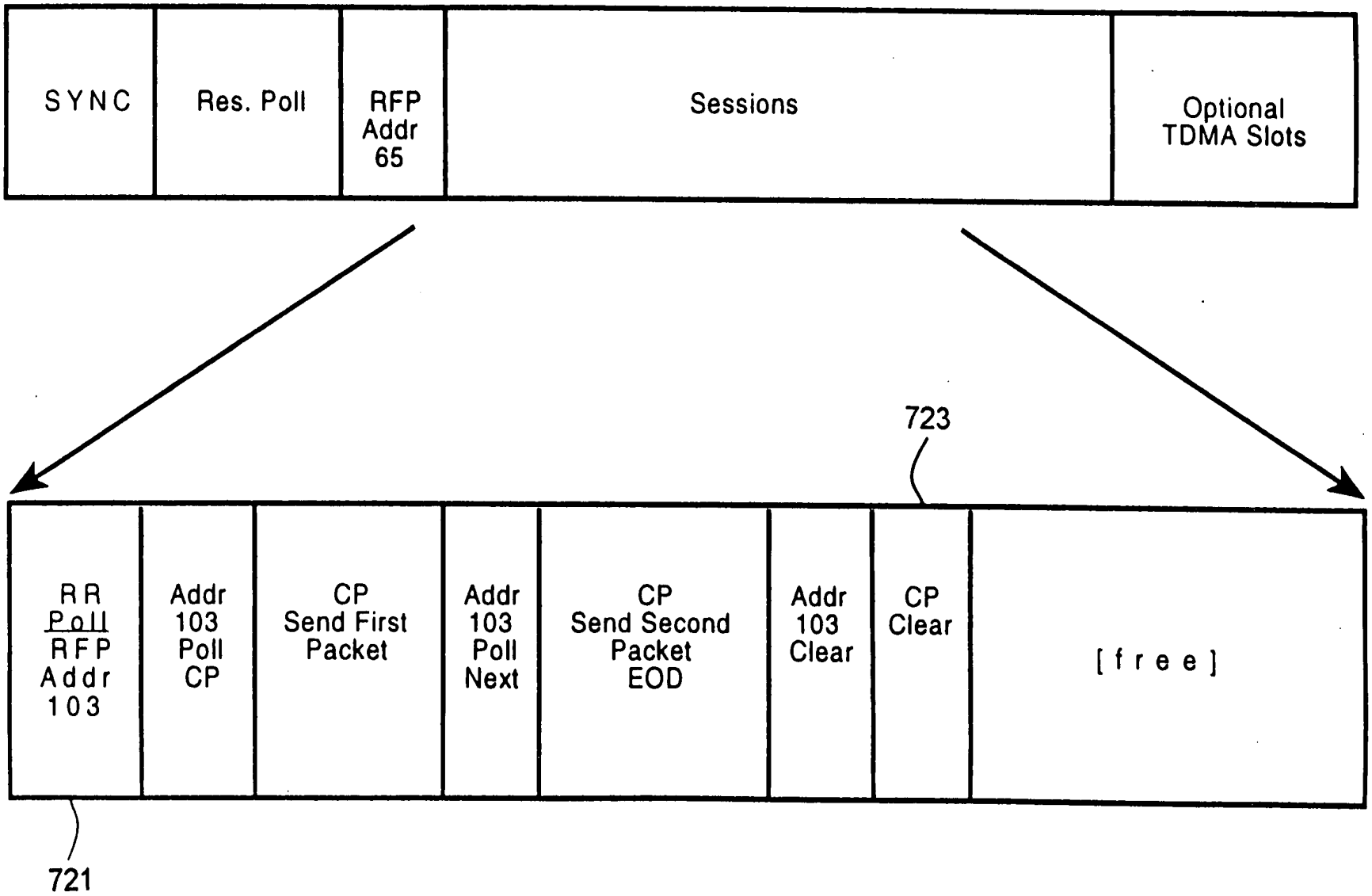

SYNC
Res. Poll
RFP Addr 65
Sessions
Optional TDMA Slots
723
RR Poll RFP Addr 103
Addr 103 Poll CP
CP Send First Packet
Addr 103 Poll Next
CP Send Second Packet EOD
Addr 103 Clear
CP Clear
[f r e e]
721

Figure 7B

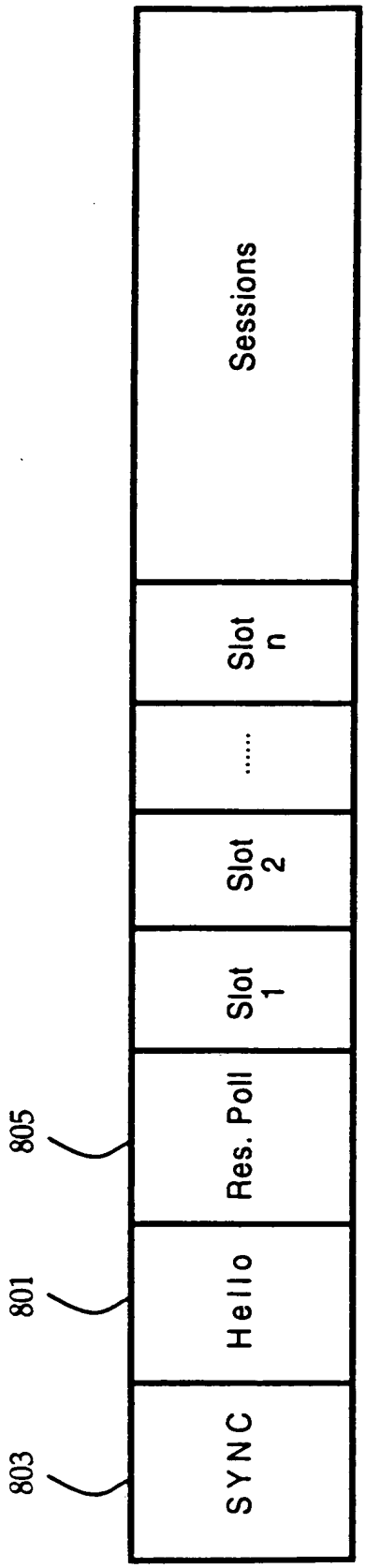


Figure 8

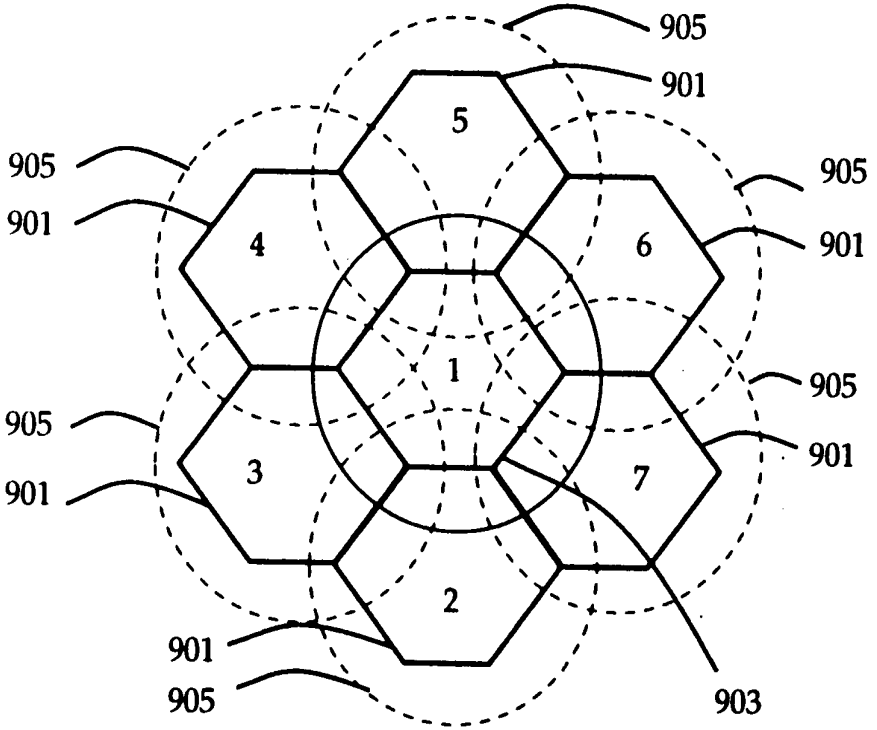


Figure 9A

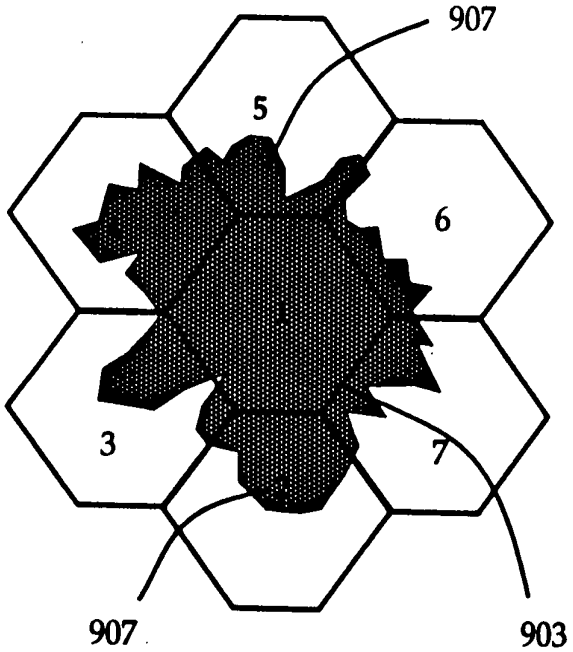


Figure 9B

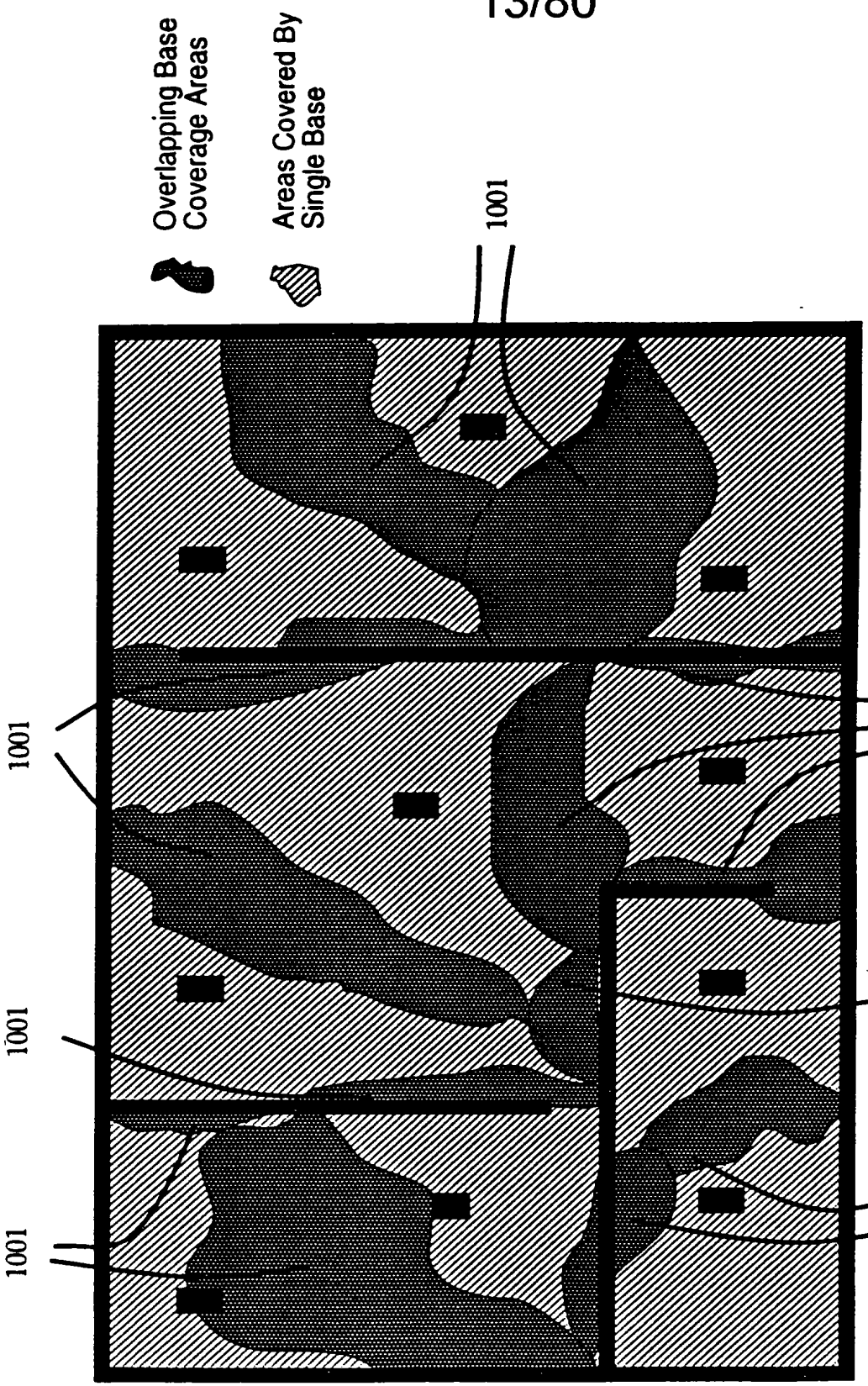

Overlapping Base Coverage Areas
Areas Covered By Single Base
1001
1001
1001
1001
1001
1001
1001

Figure 10

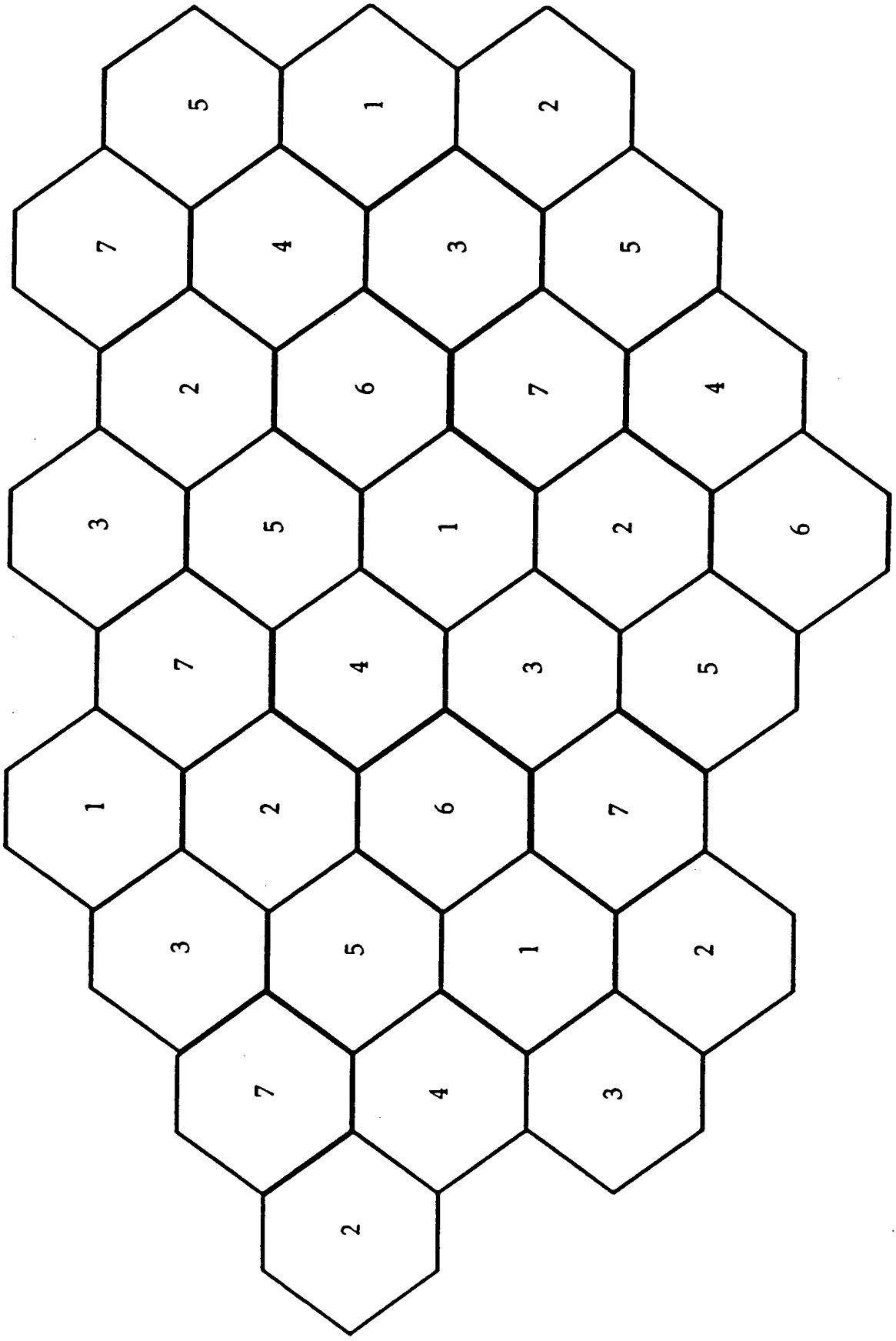


Figure 11

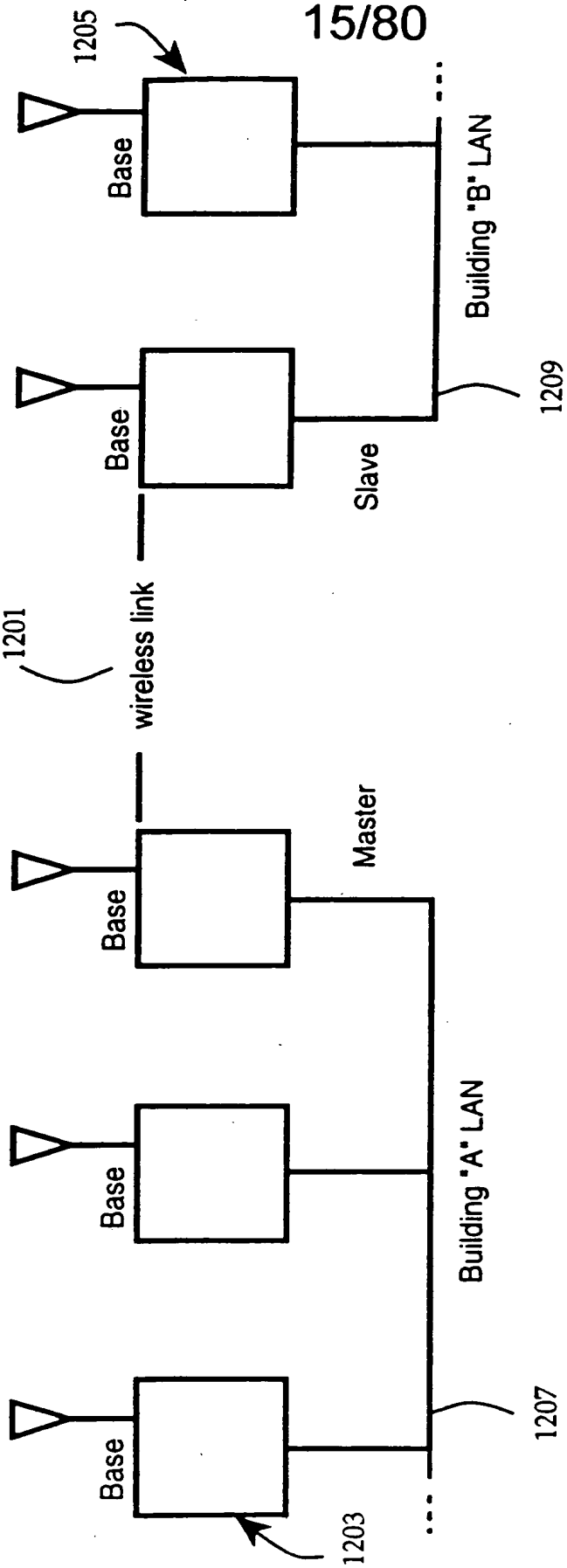

1205
Base
Building "B" LAN
Base
Slave
1209
1201
wireless link
Base
Master
Base
Building "A" LAN
Base
1207
1203

Figure 12

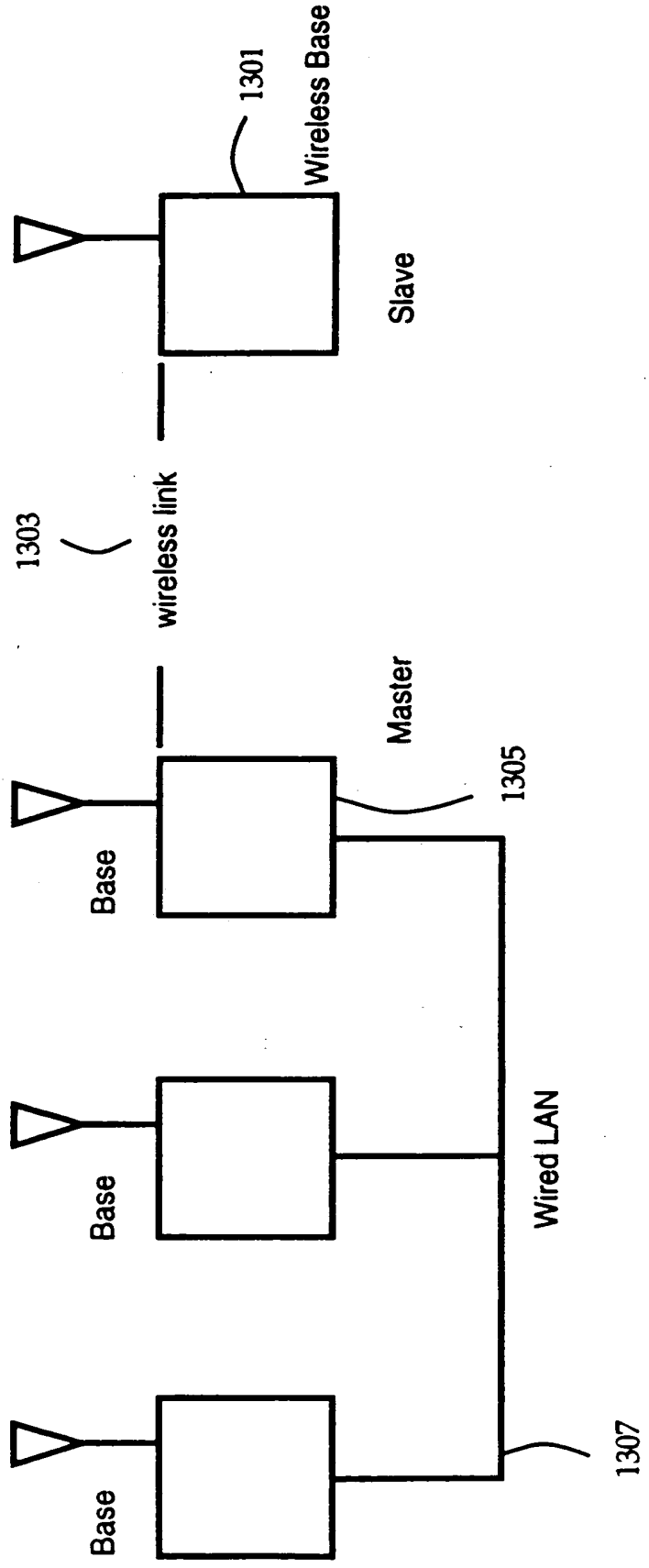

1301
Wireless Base
Slave
1303
wireless link
Master
1305
Base
Base
Base
Wired LAN
1307

Figure 13

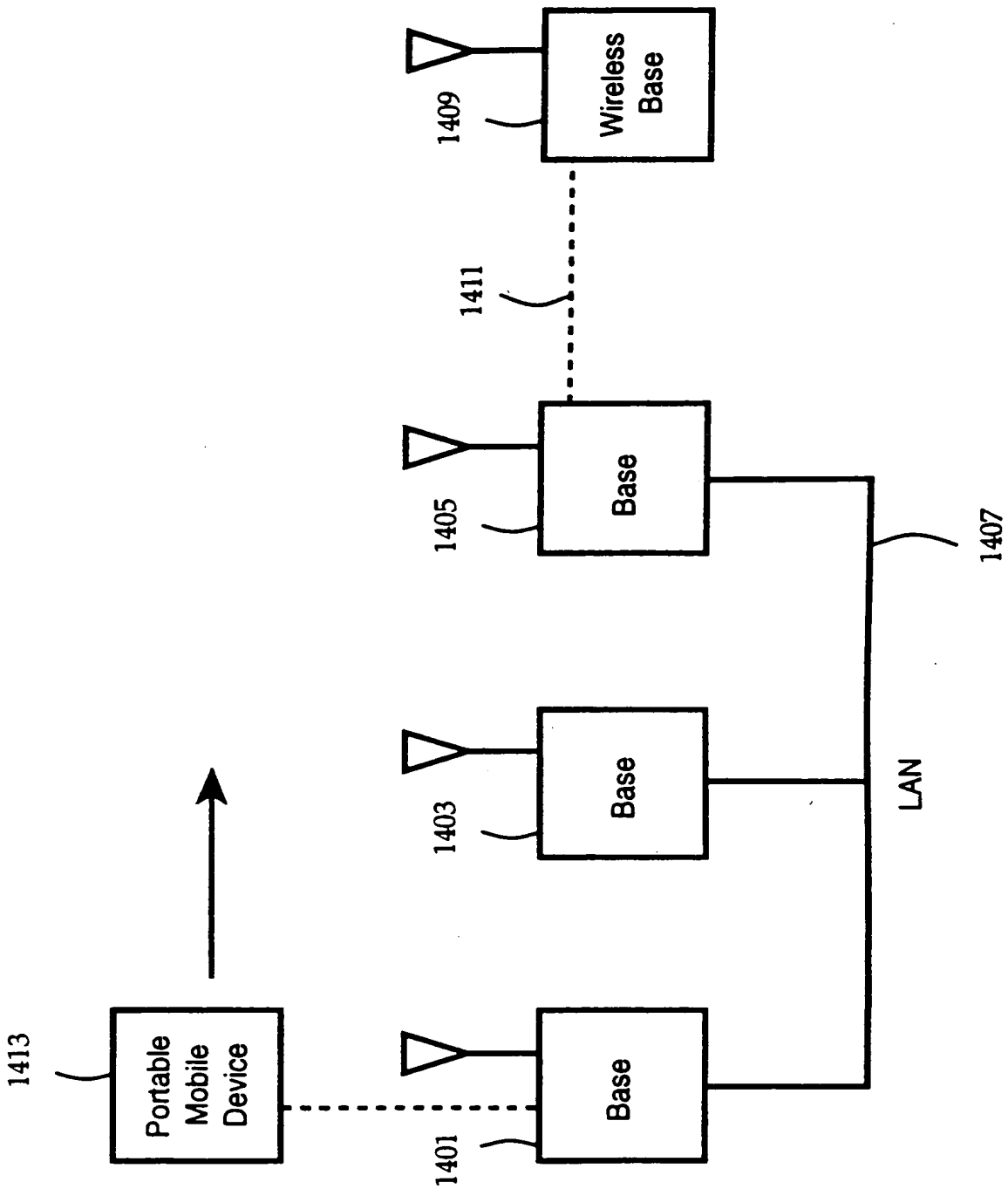

Wireless Base
1409
1411
Base
1405
Base
1403
Base
1401
LAN
1407
Portable Mobile Device
1413

Figure 14

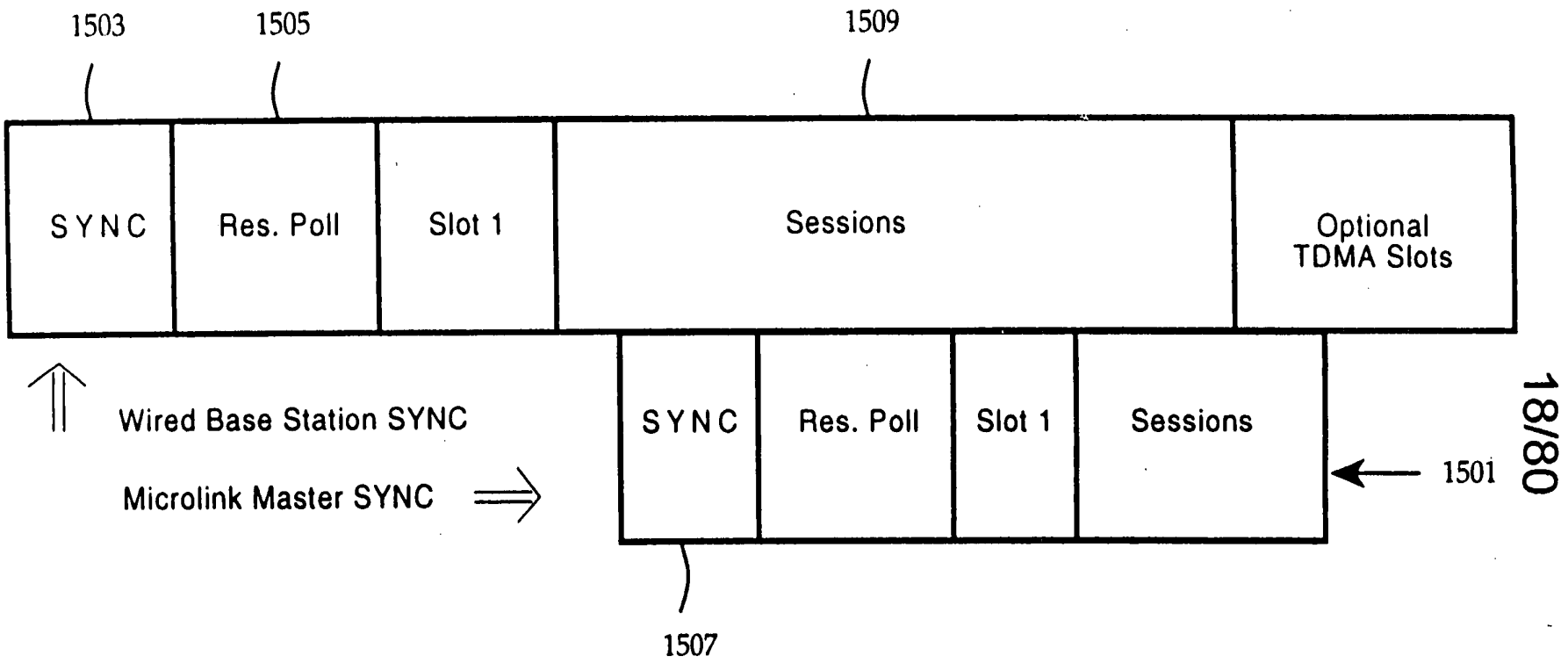

1503
1505
1509
SYNC
Res. Poll
Slot 1
Sessions
Optional TDMA Slots
Wired Base Station SYNC
Microlink Master SYNC
SYNC
Res. Poll
Slot 1
Sessions
1501
1507

Figure 15

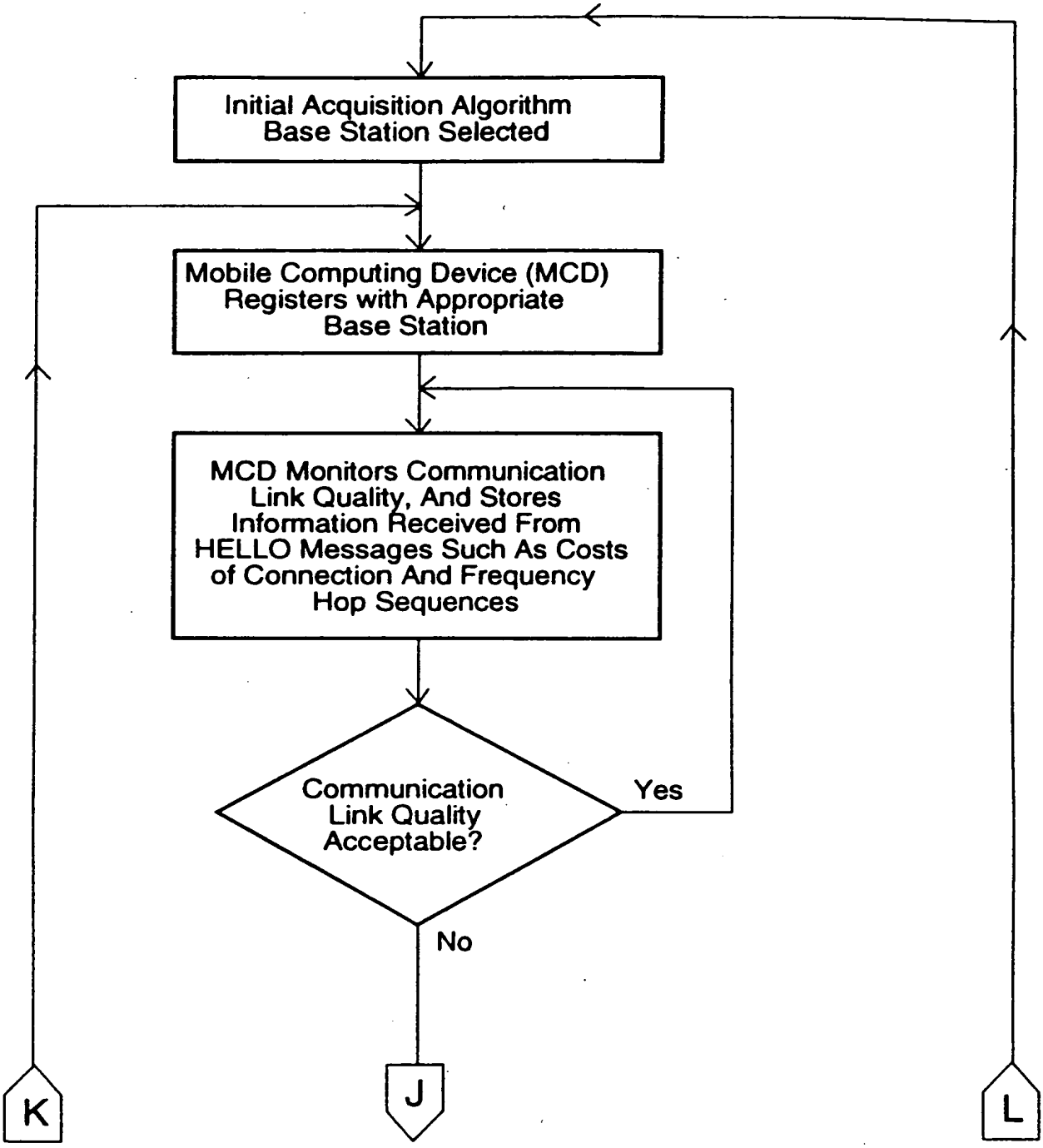

Initial Acquisition Algorithm
Base Station Selected
Mobile Computing Device (MCD)
Registers with Appropriate
Base Station
MCD Monitors Communication
Link Quality, And Stores
Information Received From
HELLO Messages Such As Costs
of Connection And Frequency
Hop Sequences
Communication
Link Quality
Acceptable?
Yes
No
J
K
L

Figure 16A

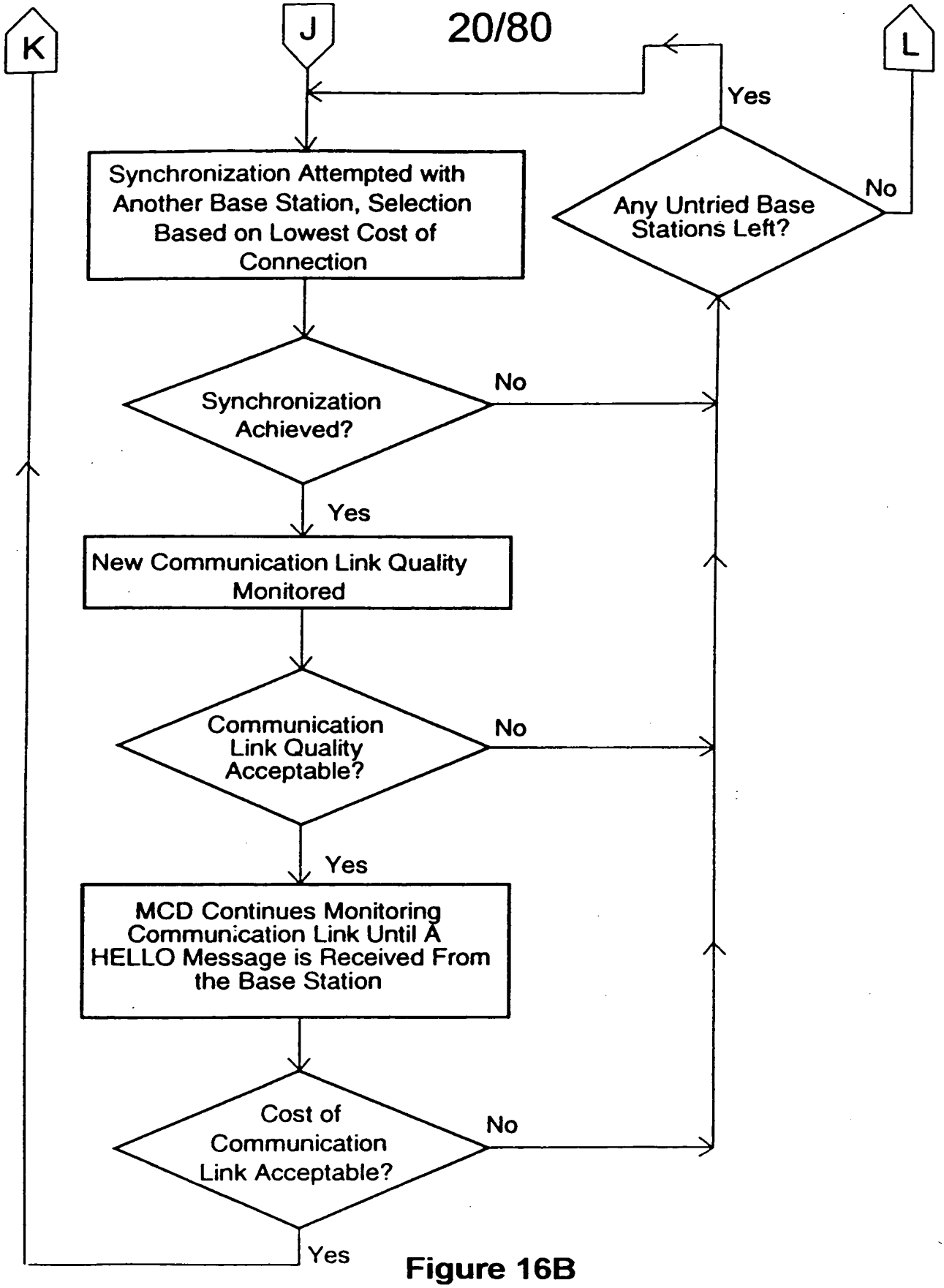

K
J
L
Synchronization Attempted with Another Base Station, Selection Based on Lowest Cost of Connection
Synchronization Achieved?
No
Yes
New Communication Link Quality Monitored
Communication Link Quality Acceptable?
No
Yes
MCD Continues Monitoring Communication Link Until A HELLO Message is Received From the Base Station
Cost of Communication Link Acceptable?
No
Yes
Any Untried Base Stations Left?
Yes
No

Figure 16B

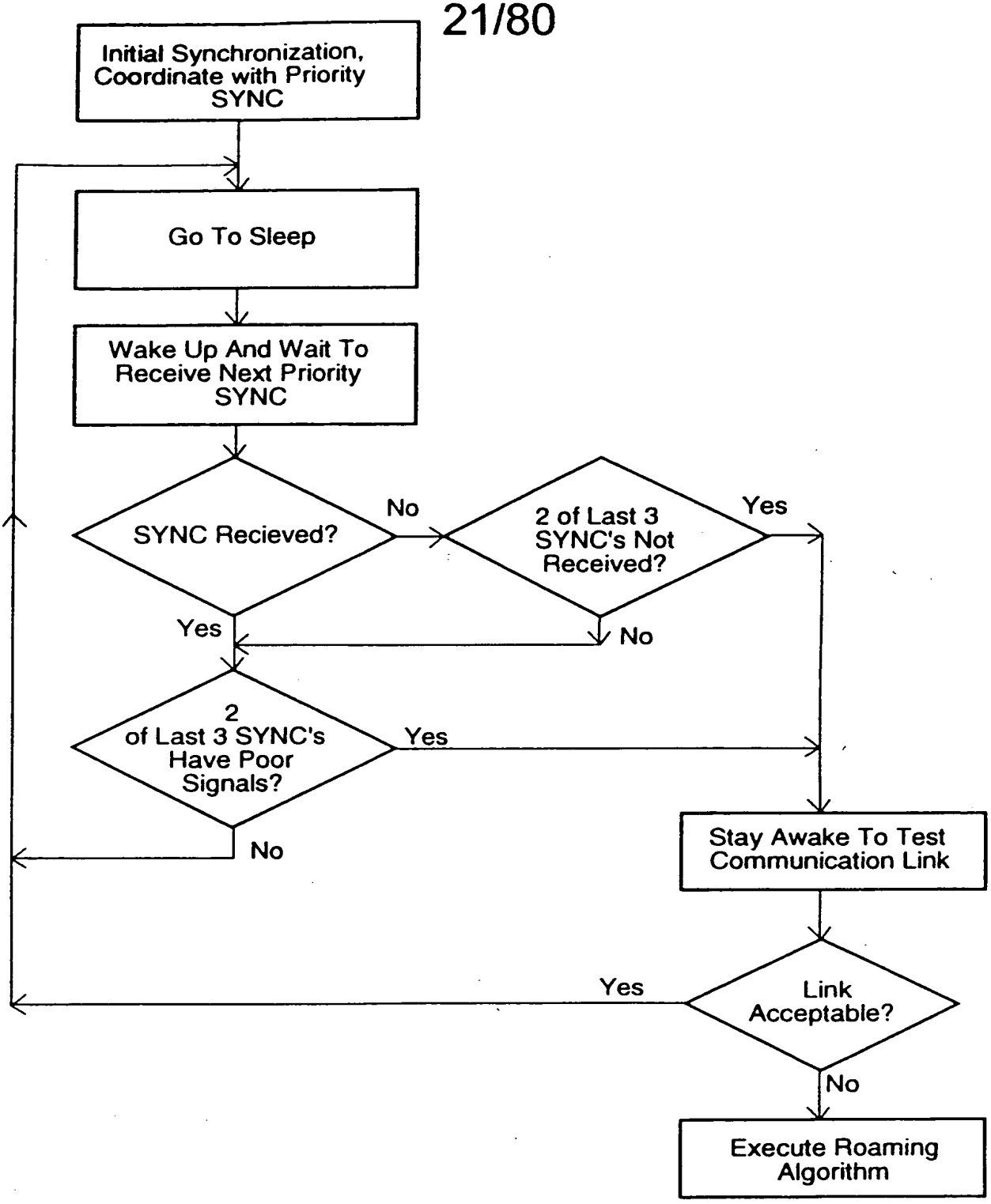

Initial Synchronization, Coordinate with Priority SYNC
Go To Sleep
Wake Up And Wait To Receive Next Priority SYNC
SYNC Recieved?
No
2 of Last 3 SYNC's Not Received?
Yes
Yes
No
2 of Last 3 SYNC's Have Poor Signals?
Yes
No
Stay Awake To Test Communication Link
Link Acceptable?
Yes
No
Execute Roaming Algorithm

Figure 17

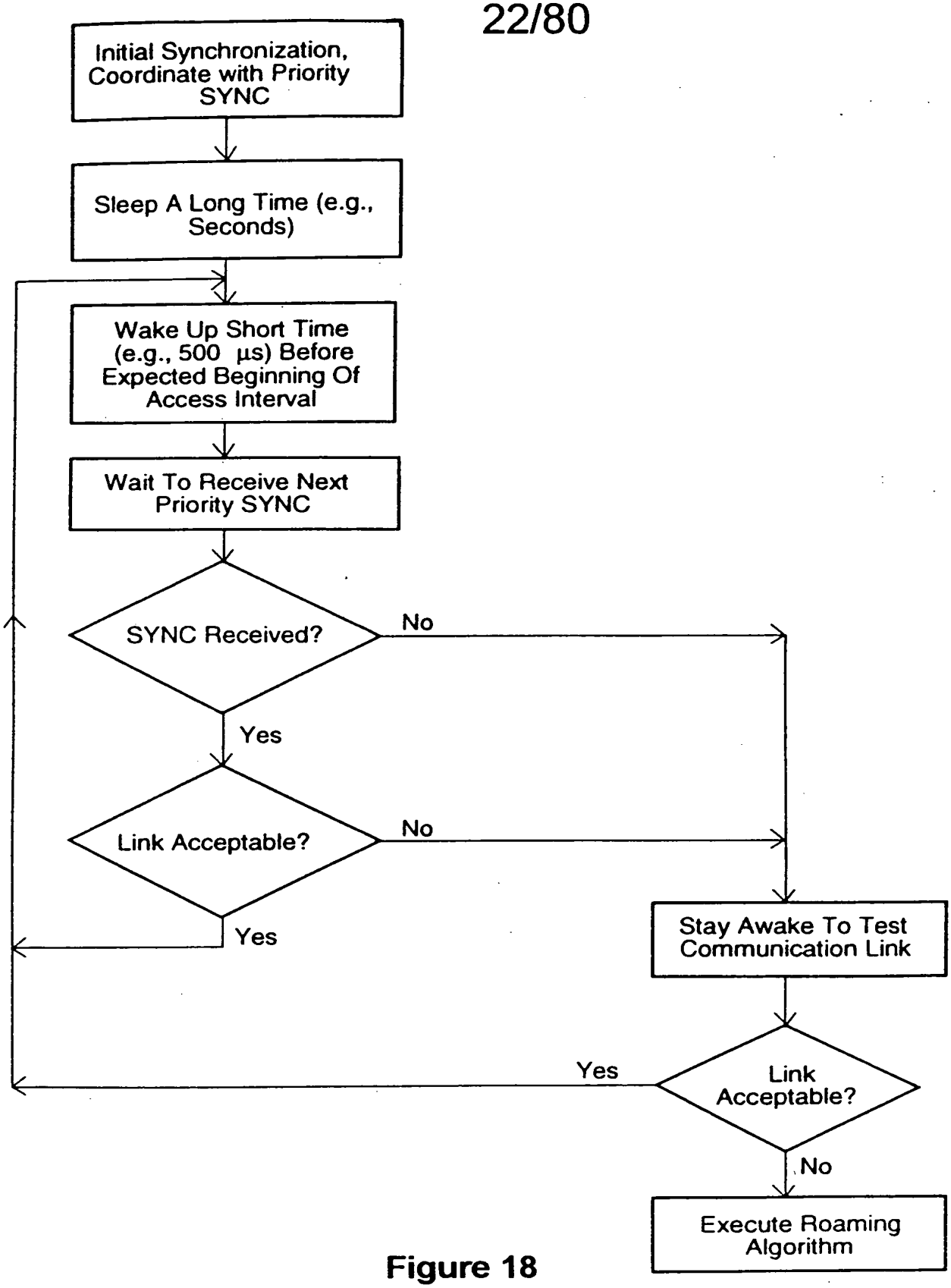

Initial Synchronization, Coordinate with Priority SYNC
Sleep A Long Time (e.g., Seconds)
Wake Up Short Time (e.g., 500 µs) Before Expected Beginning Of Access Interval
Wait To Receive Next Priority SYNC
SYNC Received?
No
Yes
Link Acceptable?
No
Yes
Stay Awake To Test Communication Link
Link Acceptable?
Yes
No
Execute Roaming Algorithm

Figure 18

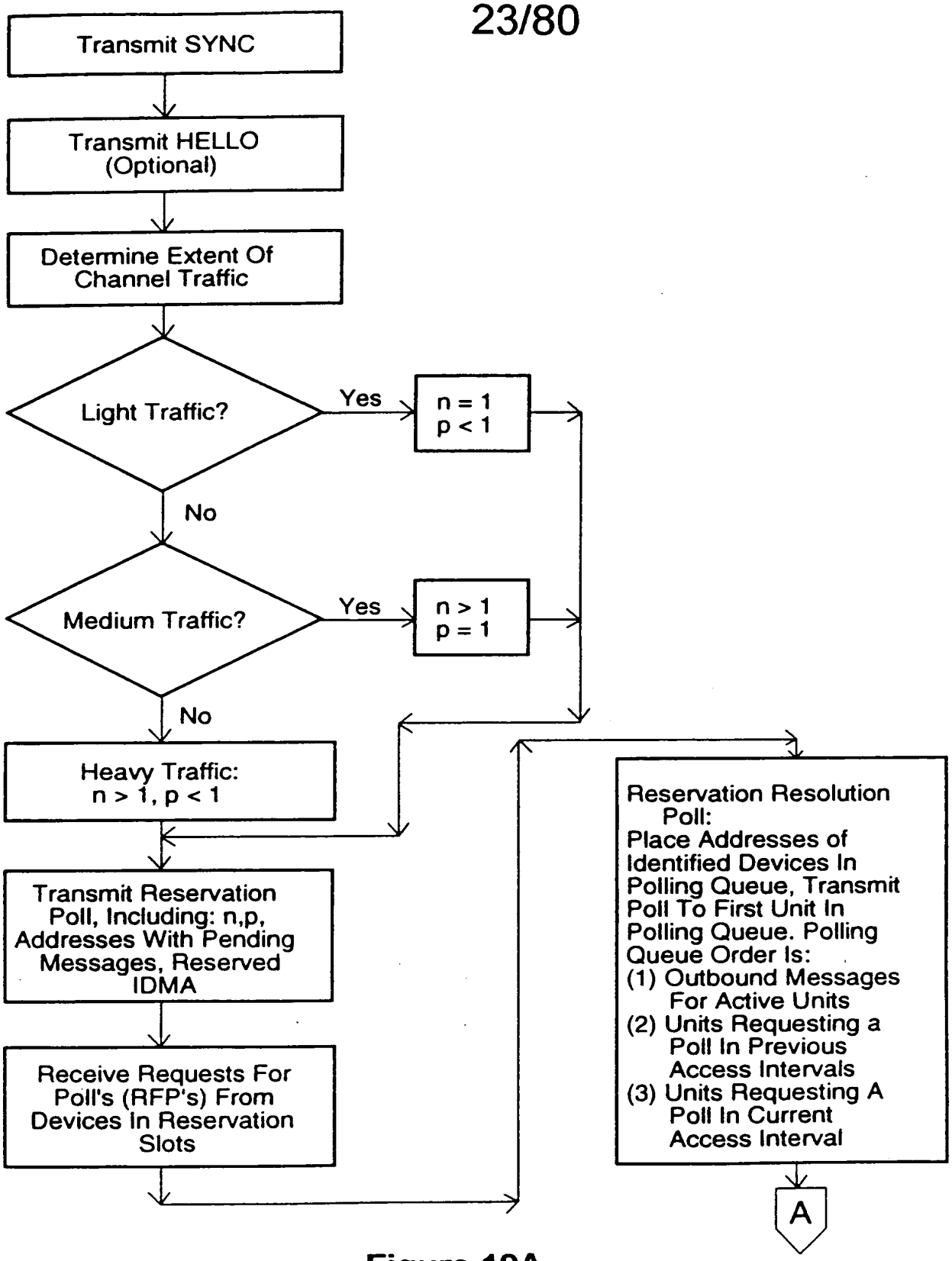

Transmit SYNC
Transmit HELLO (Optional)
Determine Extent Of Channel Traffic
Light Traffic?
Yes
n = 1
p < 1
No
Medium Traffic?
Yes
n > 1
p = 1
No
Heavy Traffic: n > 1, p < 1
Transmit Reservation Poll, Including: n,p, Addresses With Pending Messages, Reserved IDMA
Receive Requests For Poll's (RFP's) From Devices In Reservation Slots
Reservation Resolution Poll:
Place Addresses of Identified Devices In Polling Queue, Transmit Poll To First Unit In Polling Queue. Polling Queue Order Is:
(1) Outbound Messages For Active Units
(2) Units Requesting a Poll In Previous Access Intervals
(3) Units Requesting A Poll In Current Access Interval
A

Figure 19A

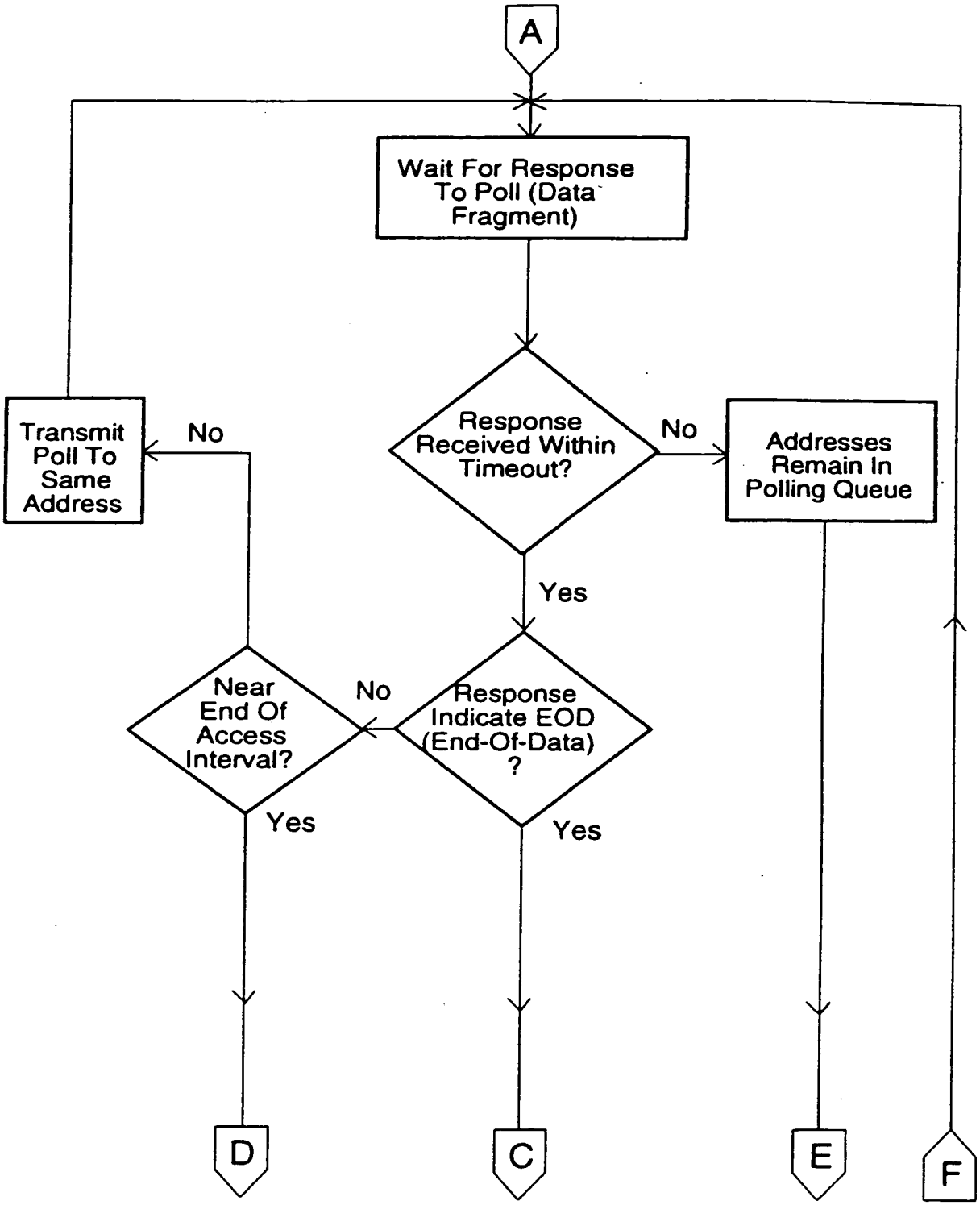

A
Wait For Response To Poll (Data Fragment)
Response Received Within Timeout?
No
Addresses Remain In Polling Queue
Yes
Response Indicate EOD (End-Of-Data) ?
No
Near End Of Access Interval?
No
Transmit Poll To Same Address
Yes
Yes
D
C
E
F

Figure 19B-1

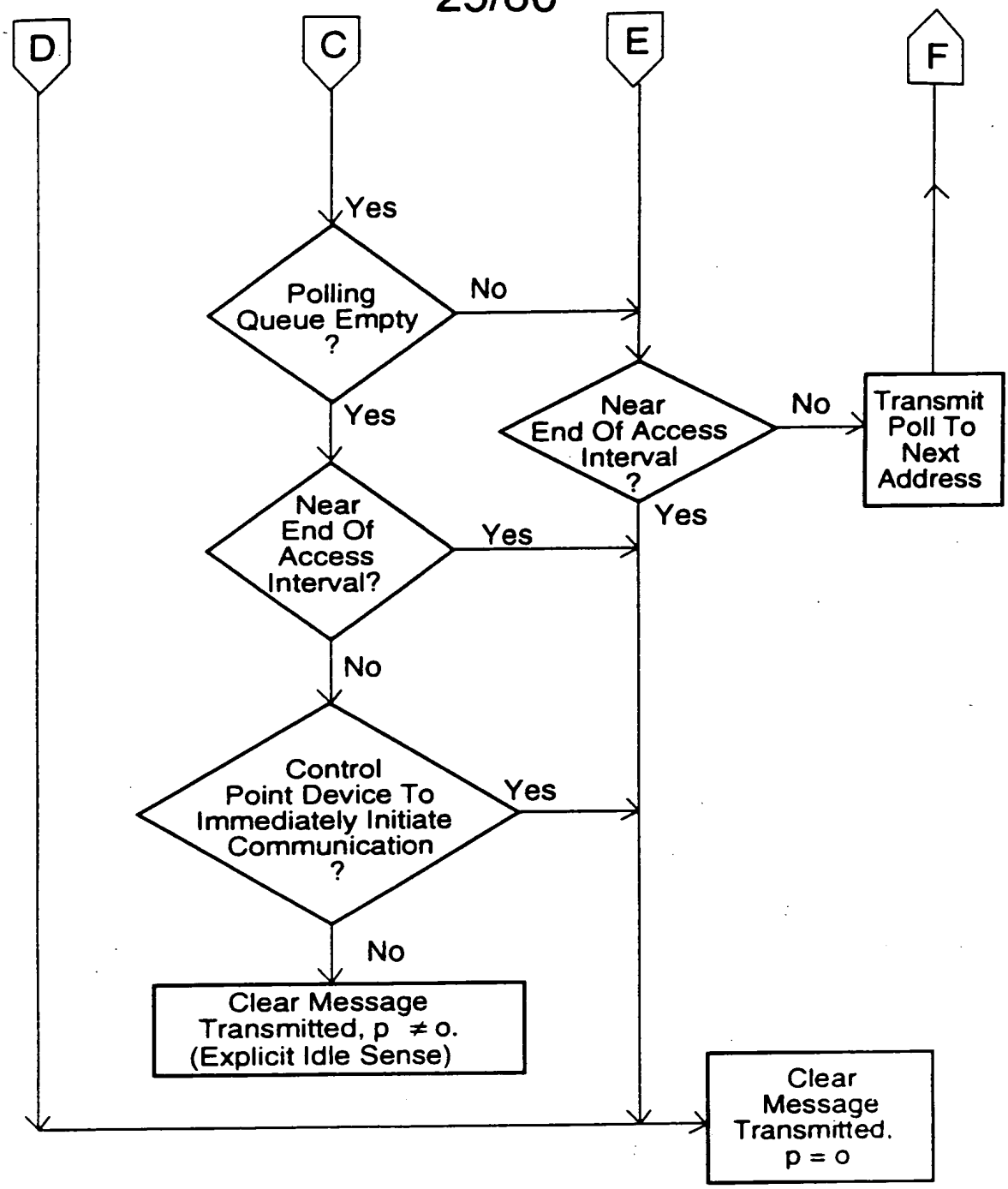

D
C
E
F
Yes
Polling Queue Empty ?
No
Yes
Near End Of Access Interval ?
No
Transmit Poll To Next Address
Yes
Near End Of Access Interval?
Yes
No
Control Point Device To Immediately Initiate Communication ?
Yes
No
Clear Message Transmitted, p ≠ o. (Explicit Idle Sense)
Clear Message Transmitted. p = o

Figure 19B- 2

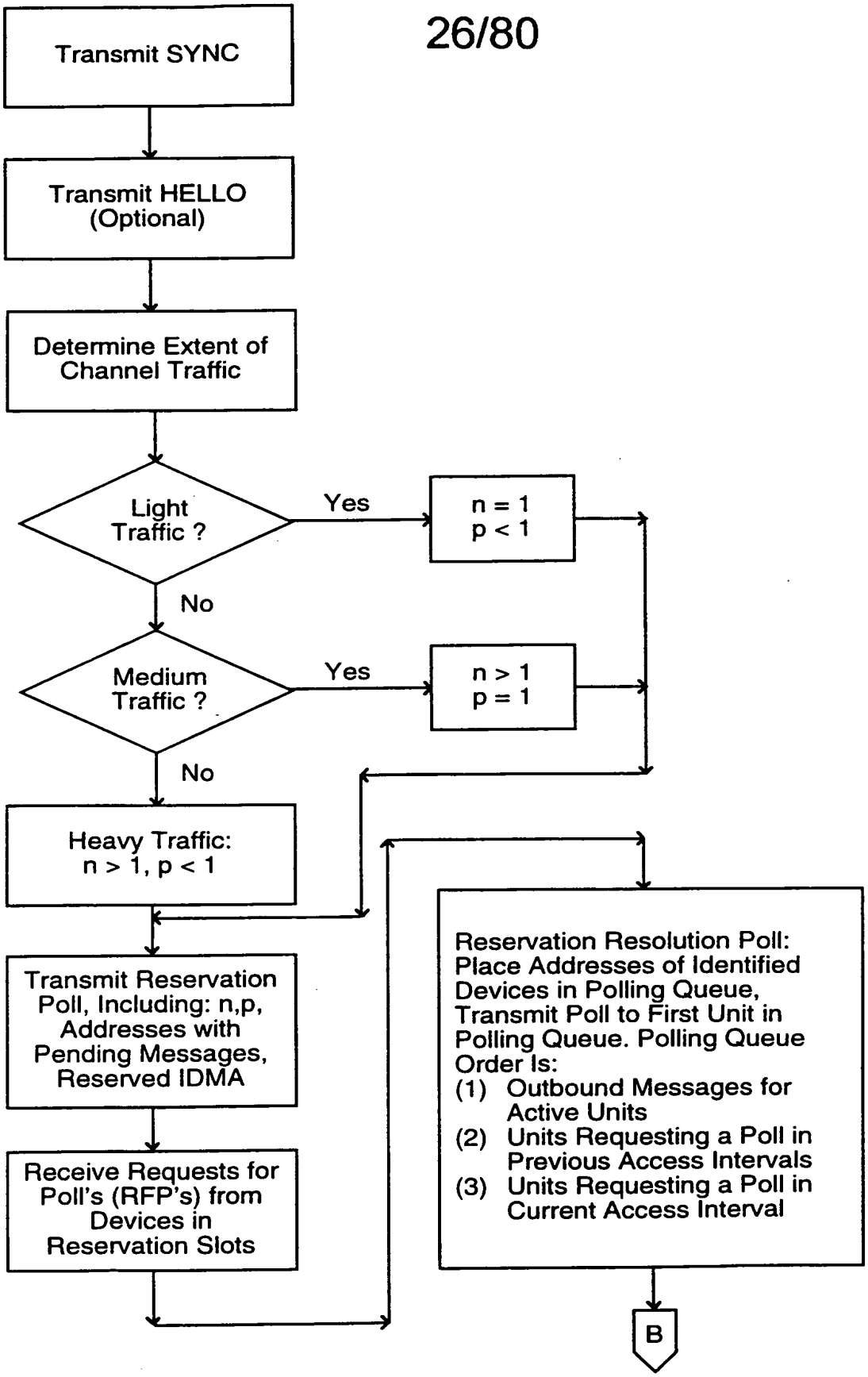

Transmit SYNC
Transmit HELLO (Optional)
Determine Extent of Channel Traffic
Light Traffic ?
Yes
n = 1
p < 1
No
Medium Traffic ?
Yes
n > 1
p = 1
No
Heavy Traffic: n > 1, p < 1
Transmit Reservation Poll, Including: n,p, Addresses with Pending Messages, Reserved IDMA
Receive Requests for Poll's (RFP's) from Devices in Reservation Slots
Reservation Resolution Poll: Place Addresses of Identified Devices in Polling Queue, Transmit Poll to First Unit in Polling Queue. Polling Queue Order Is:
(1) Outbound Messages for Active Units
(2) Units Requesting a Poll in Previous Access Intervals
(3) Units Requesting a Poll in Current Access Interval
B

Figure 20A

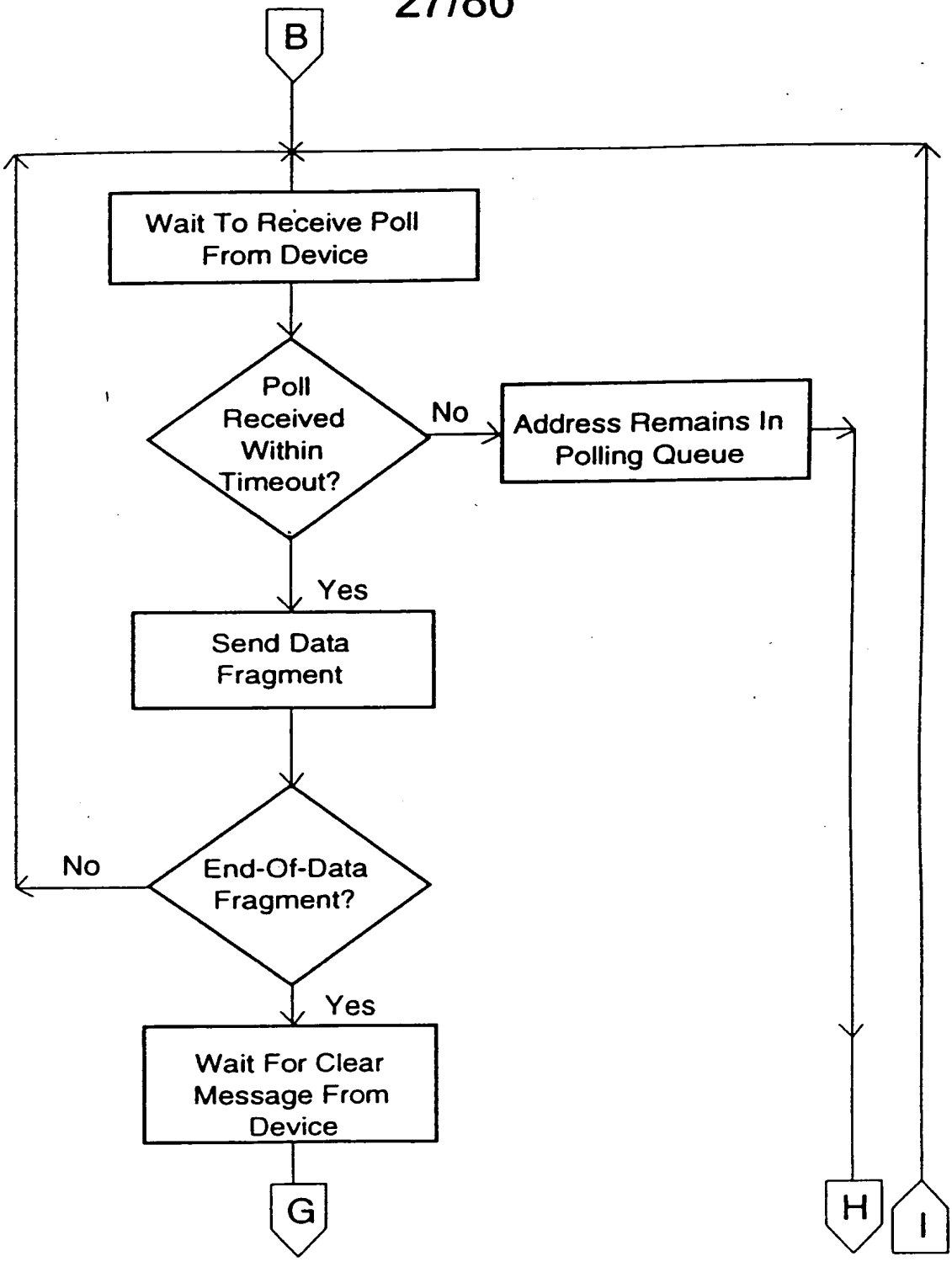

B
Wait To Receive Poll From Device
Poll Received Within Timeout?
No
Address Remains In Polling Queue
Yes
Send Data Fragment
End-Of-Data Fragment?
No
Yes
Wait For Clear Message From Device
G
H
I

Figure 20B-1

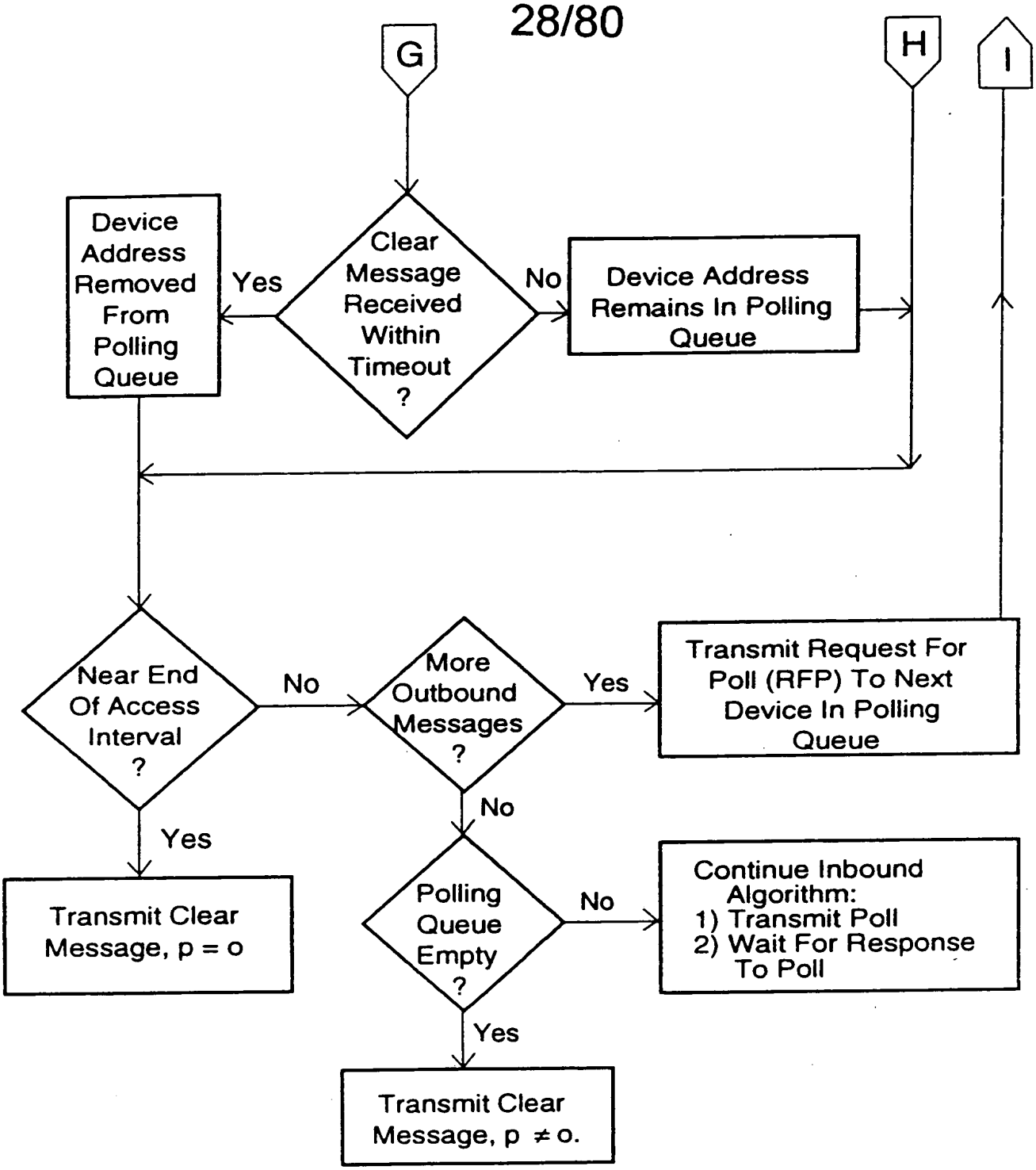

G
H
I
Device Address Removed From Polling Queue
Yes
Clear Message Received Within Timeout ?
No
Device Address Remains In Polling Queue
Near End Of Access Interval ?
No
More Outbound Messages ?
Yes
Transmit Request For Poll (RFP) To Next Device In Polling Queue
Yes
Transmit Clear Message, p = o
No
Polling Queue Empty ?
No
Continue Inbound Algorithm:
1) Transmit Poll
2) Wait For Response To Poll
Yes
Transmit Clear Message, p ≠ o.

Figure 20B-2

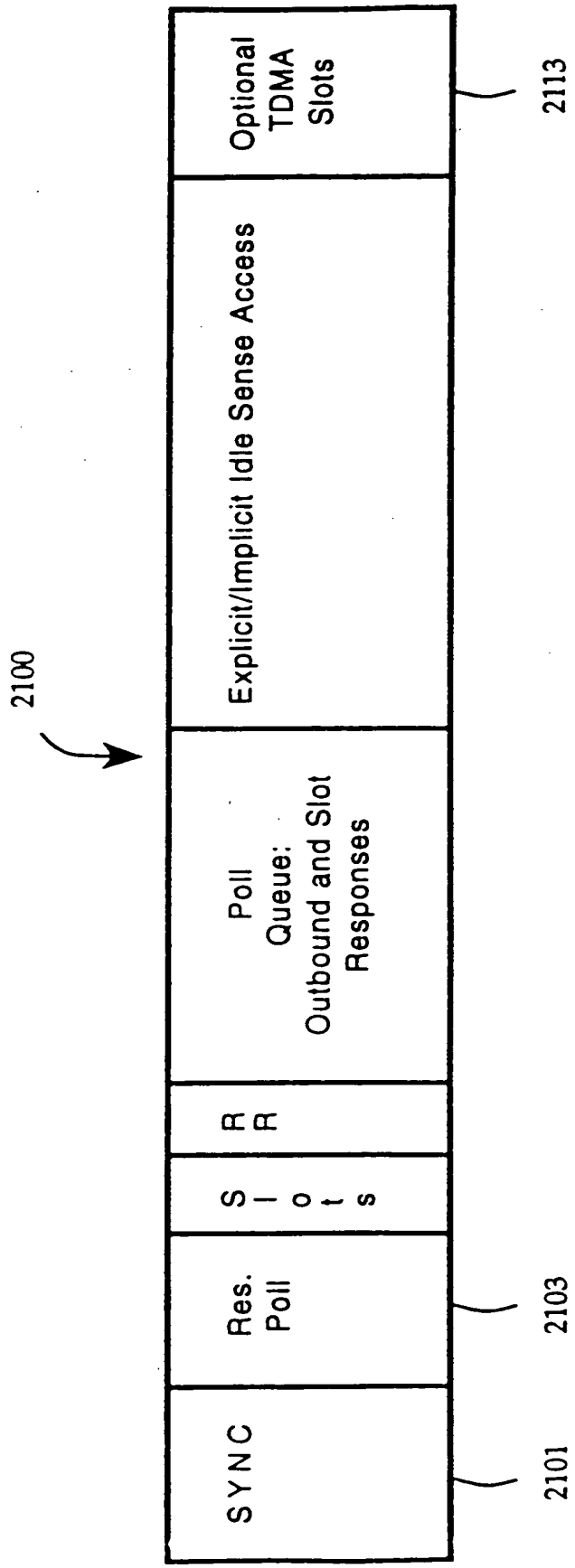

2100
SYNC
Res. Poll
S l o t s
R R
Poll Queue: Outbound and Slot Responses
Explicit/Implicit Idle Sense Access
Optional TDMA Slots
2101
2103
2113

Figure 21

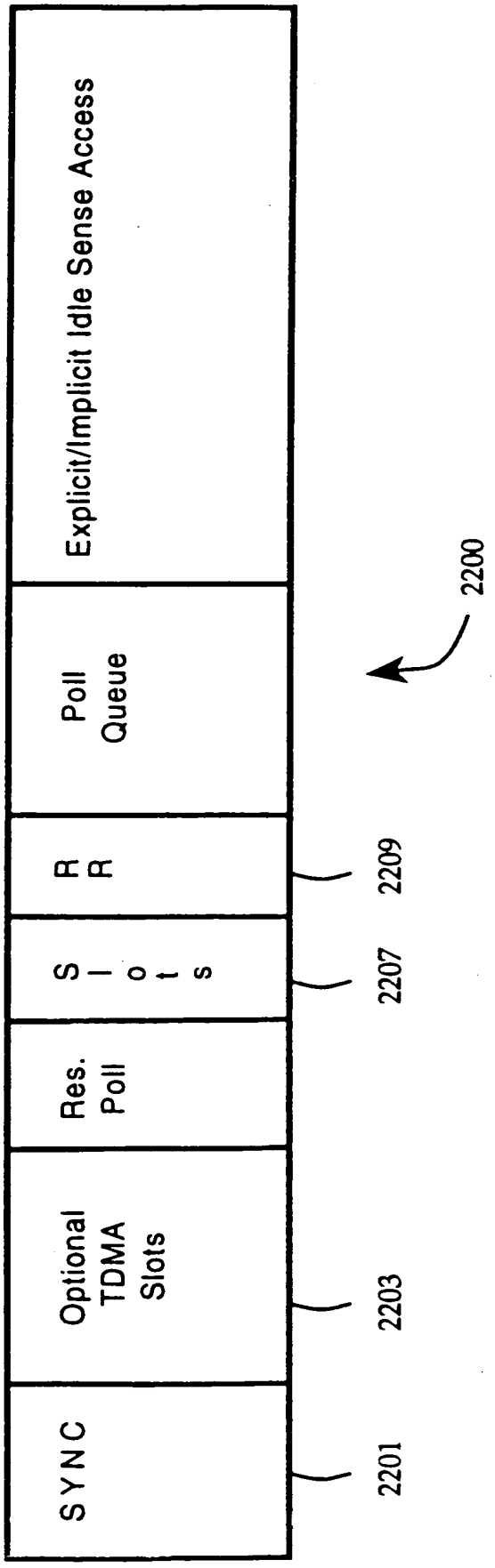

SYNC
Optional TDMA Slots
Res. Poll
S l o t s
R R
Poll Queue
Explicit/Implicit Idle Sense Access
2201
2203
2207
2209
2200

Figure 22

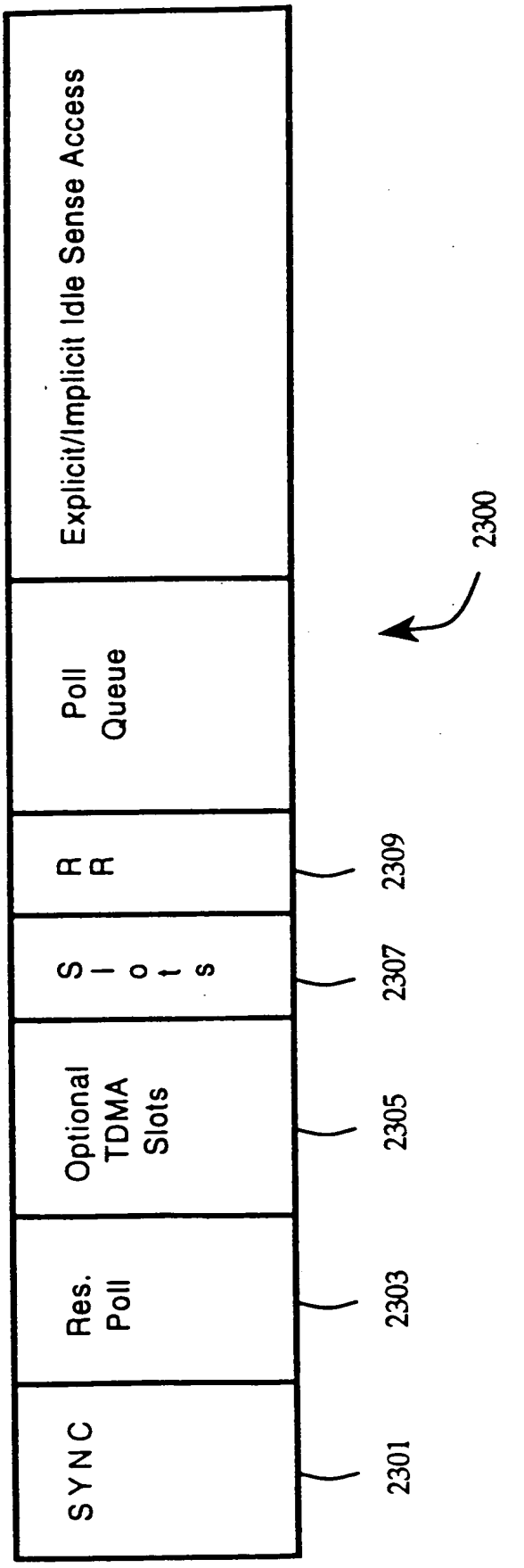

SYNC
Res. Poll
Optional TDMA Slots
S l o t s
R R
Poll Queue
Explicit/Implicit Idle Sense Access
2301
2303
2305
2307
2309
2300

Figure 23

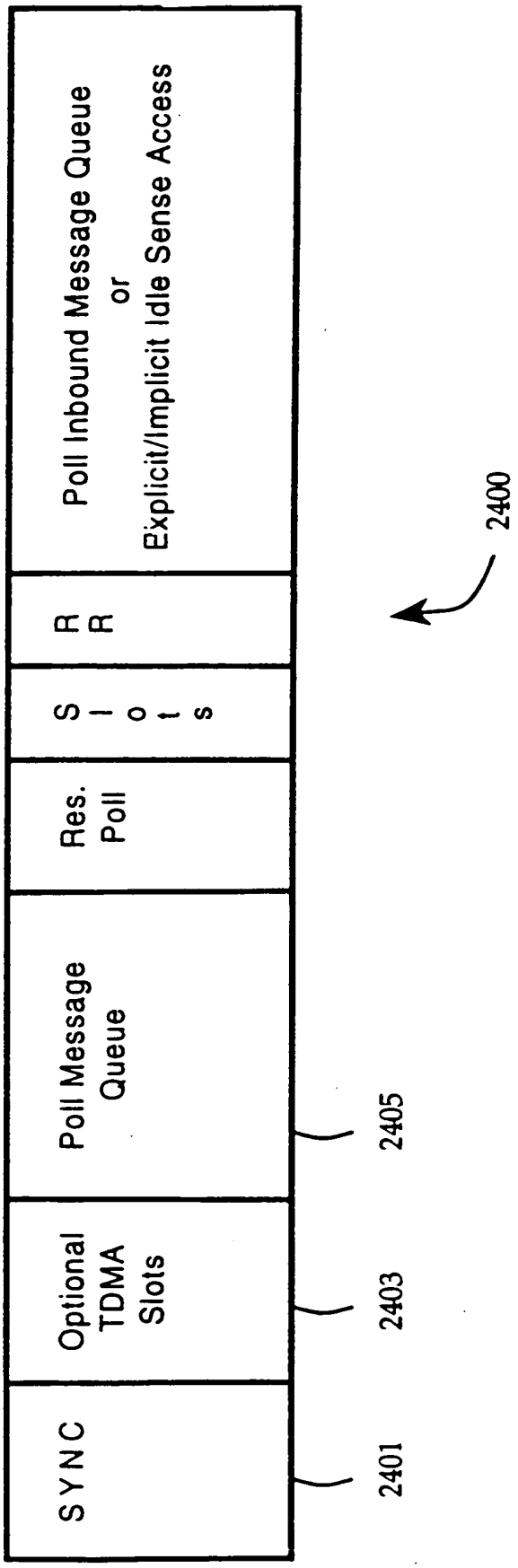
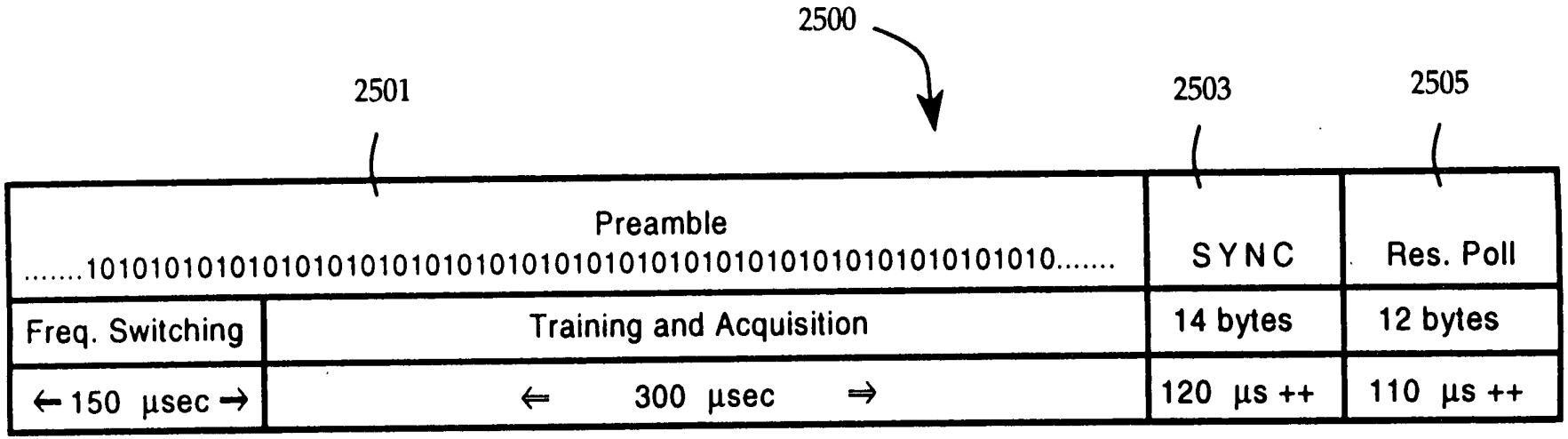

SYNC
Optional TDMA Slots
Poll Message Queue
Res. Poll
Slots
RR
Poll Inbound Message Queue
or
Explicit/Implicit Idle Sense Access
2401
2403
2405
2400

Figure 24



++ allows additional bit times for HDLC zero bit insertion

Figure 25

SYNC

2600

Byte	Content	Definition
1	FLAG	Frame Delimiter
2	Dest. Address 1	Destination Address (SYNC = Broadcast = $FFFF_H$)
3	Dest. Address 2	Destination Address, 2nd Byte
4	TYPE	Message Type=SYNC, Priority Sync, or Priority SYNC with HELLO
5	Source Address 1	Control Point Address
6	Source Address 2	Control Point Address, 2nd Byte
7*	SYSTEM ID	System Identifier (LAN ID)
8*	NET ID	Net ID
9*	Command/Status 1	Control Point Status
		2 Bits Control Point Type
		2 Bits Loading Factor
		1 Bit Scheduled Service Availability
		3 Bits Reserved
10*	Command/Status 2	Scheduled Services
		5 Bits Number of Allocated TDMA Time Slots
		3 Bits Number of Available Time Slots
11*	Random	Randomly Selected Character for Improved Encryption
12	CRC 1	Error Check
13	CRC 2	Error Check
14	FLAG	Frame Delimiter

Figure 26

*Optionally Encrypted Bytes

Reservation Poll

2700

Byte	Content	Definition
1	FLAG	Frame Delimiter
2	Dest. Address 1	Destination Address (RES = Broadcast = $FFFF_H$)
3	Dest. Address 2	Destination Address, 2nd Byte
4	TYPE	Message Type = RES POLL
5	SLOT PARMS	3 Bits Number of Slots
6		5 Bits Probability Factor
7*	Sequence	Hopping Sequence ID
8*	Index	Hopping Sequence Index
9*	NET PARMS	
		3 Bits Hop Rate
		2 Bits AI's per Hop
		3 Bits Reserved
10	CRC 1	Error Check
11	CRC 2	Error Check
12	FLAG	Frame Delimiter

Figure 27

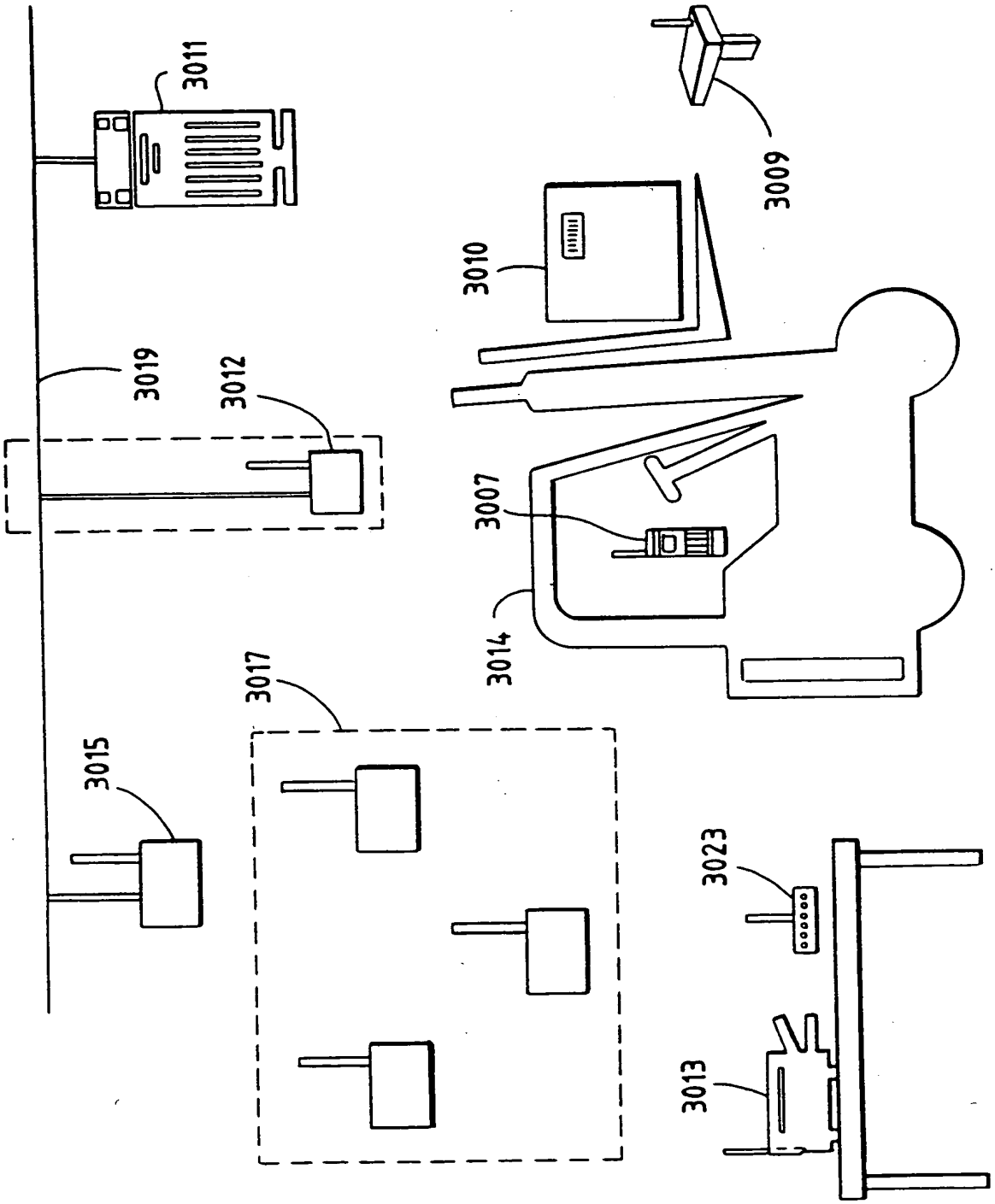


Figure 28A

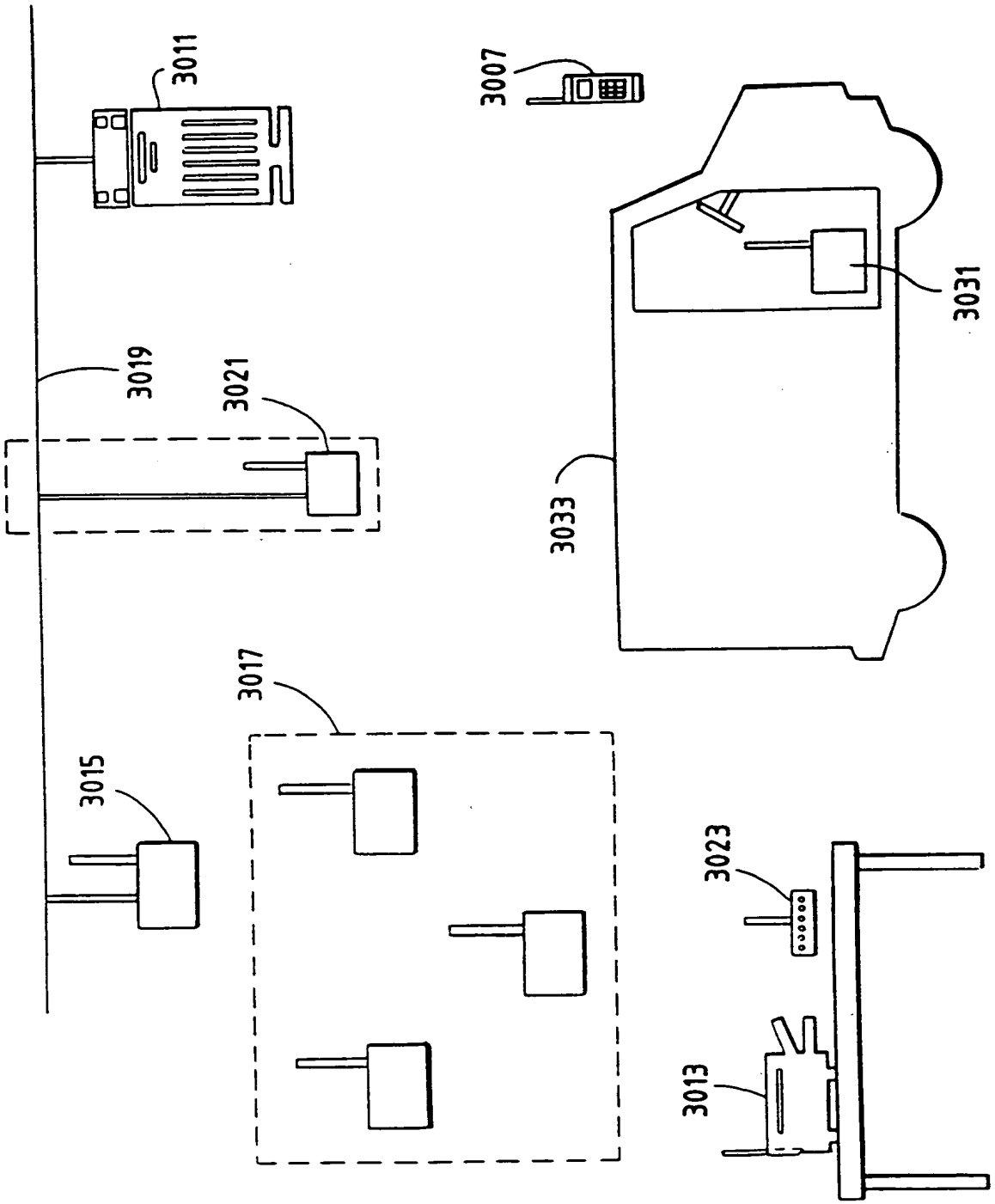


Figure 28B

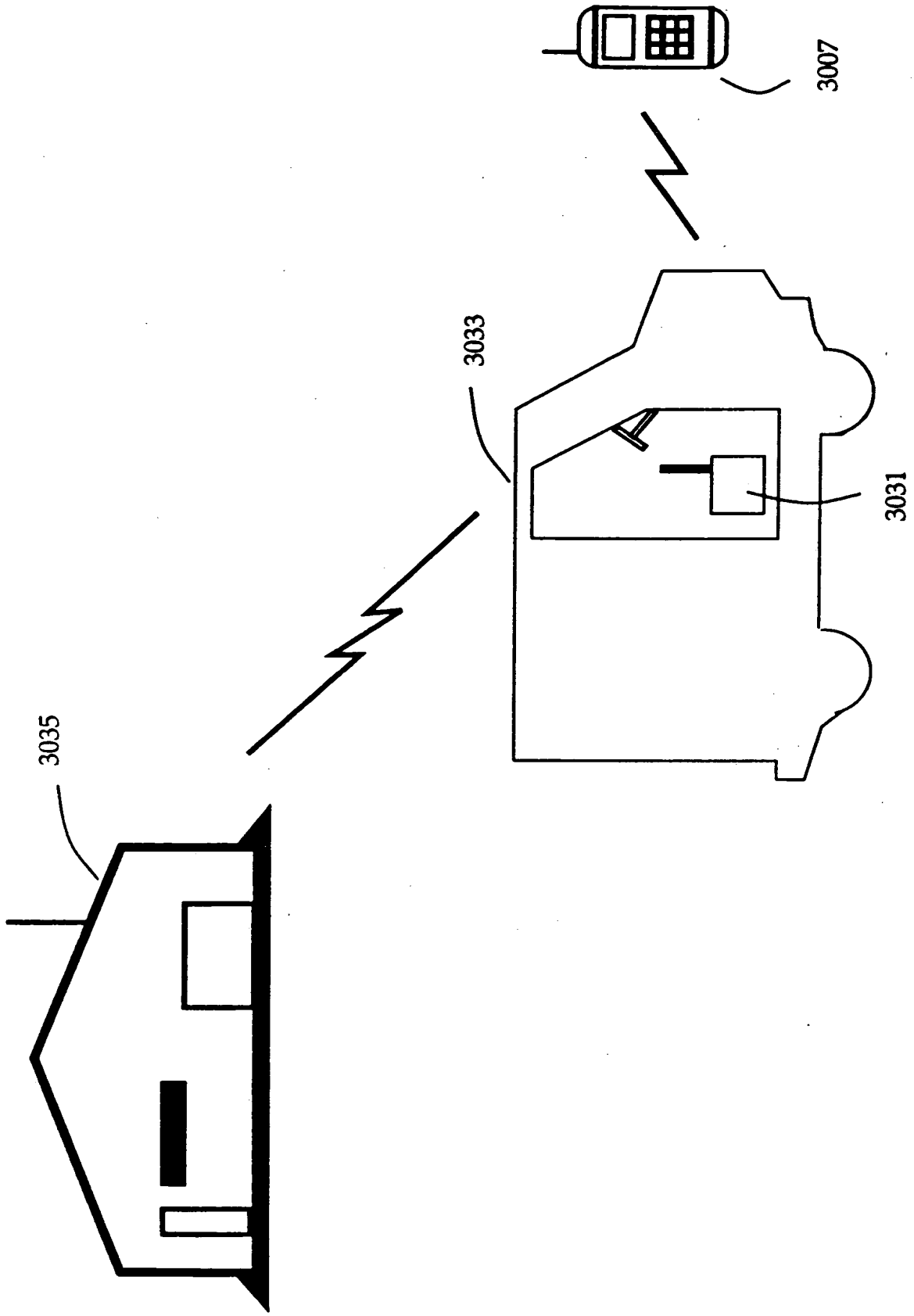


Figure 28C

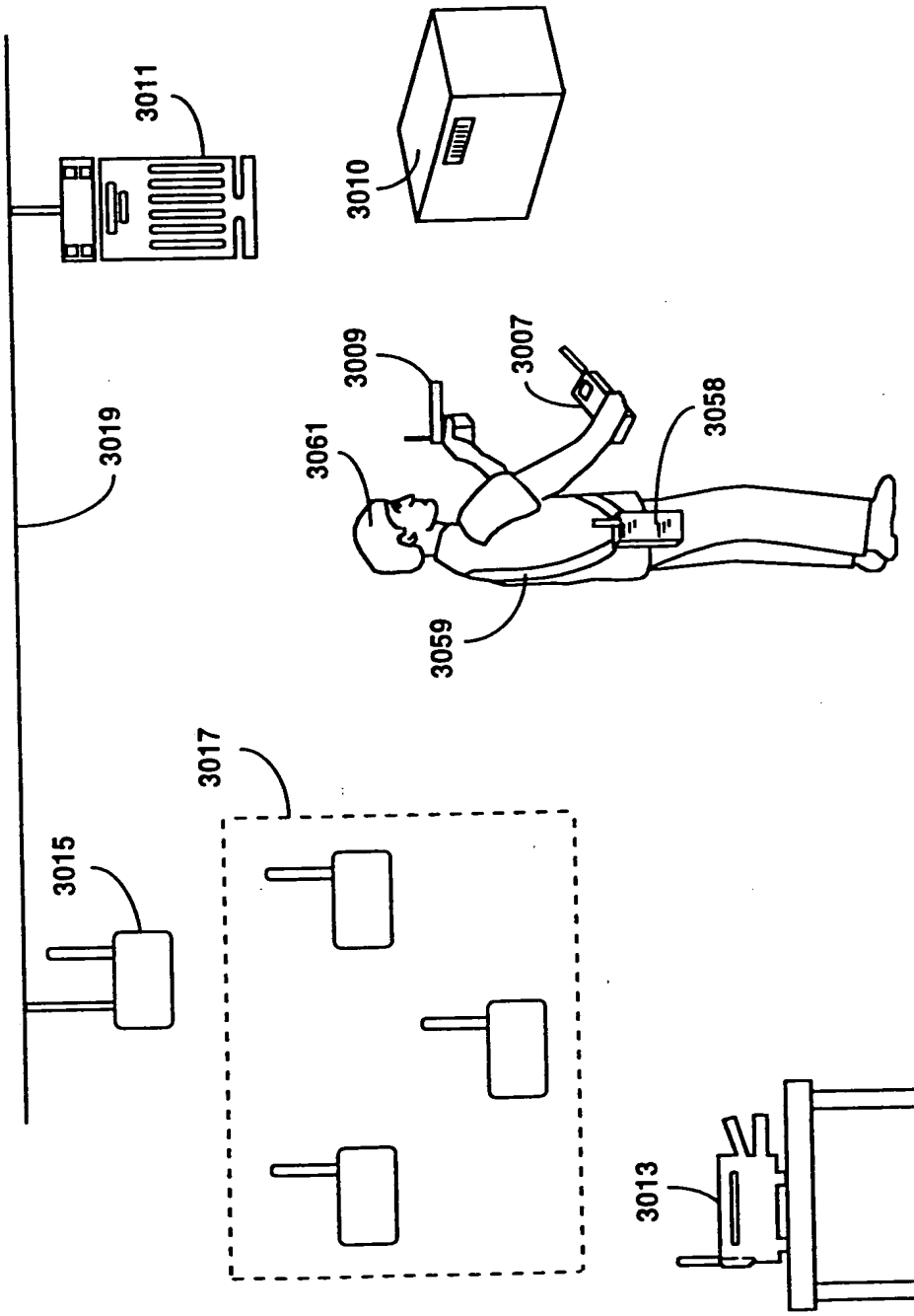


Figure 29A

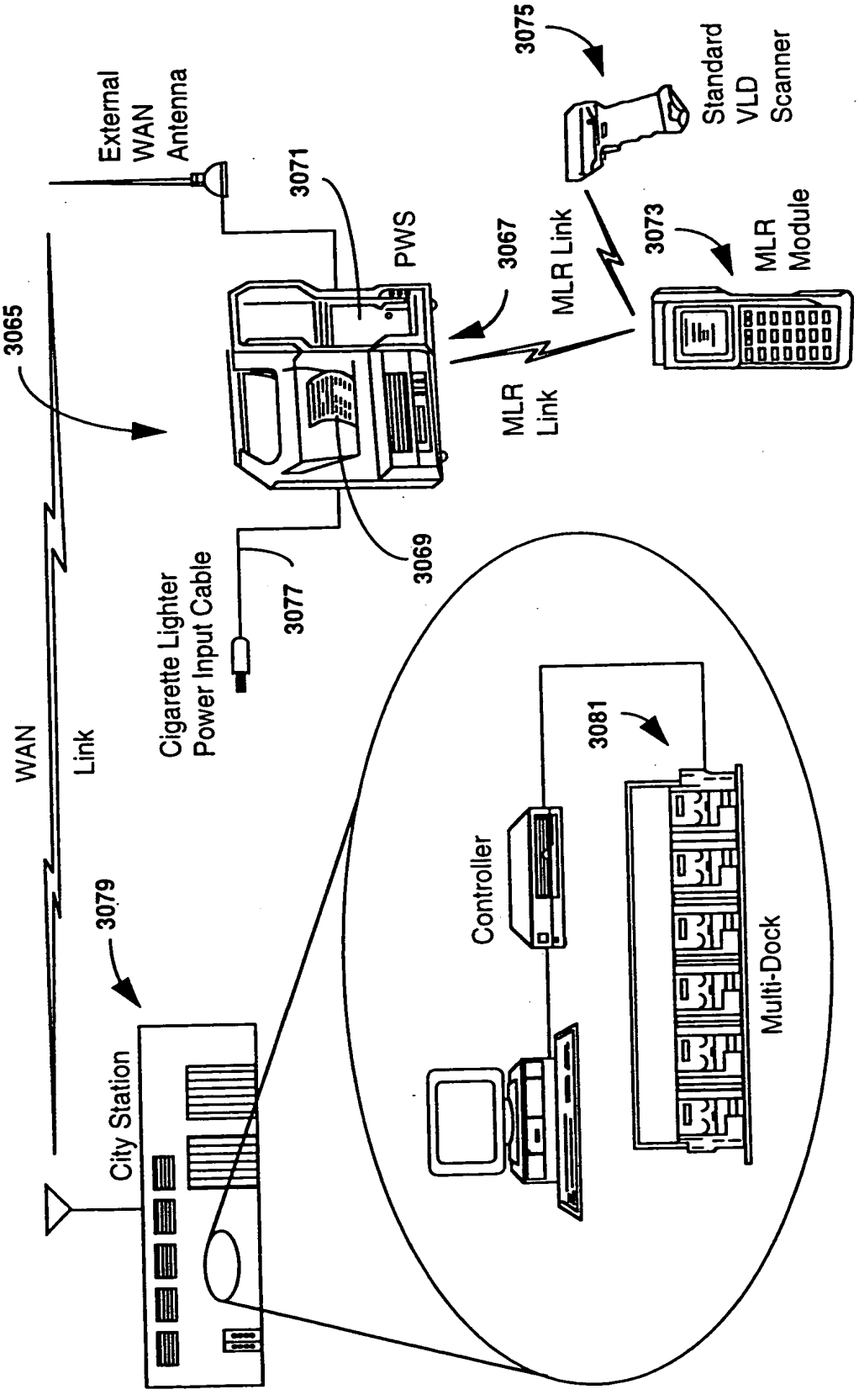

3075
Standard
VLD
Scanner
External
WAN
Antenna
3071
PWS
3067
MLR Link
3073
MLR
Module
3065
MLR
Link
3069
3077
Cigarette Lighter
Power Input Cable
WAN
Link
3079
City Station
Controller
3081
Multi-Dock

Figure 29B

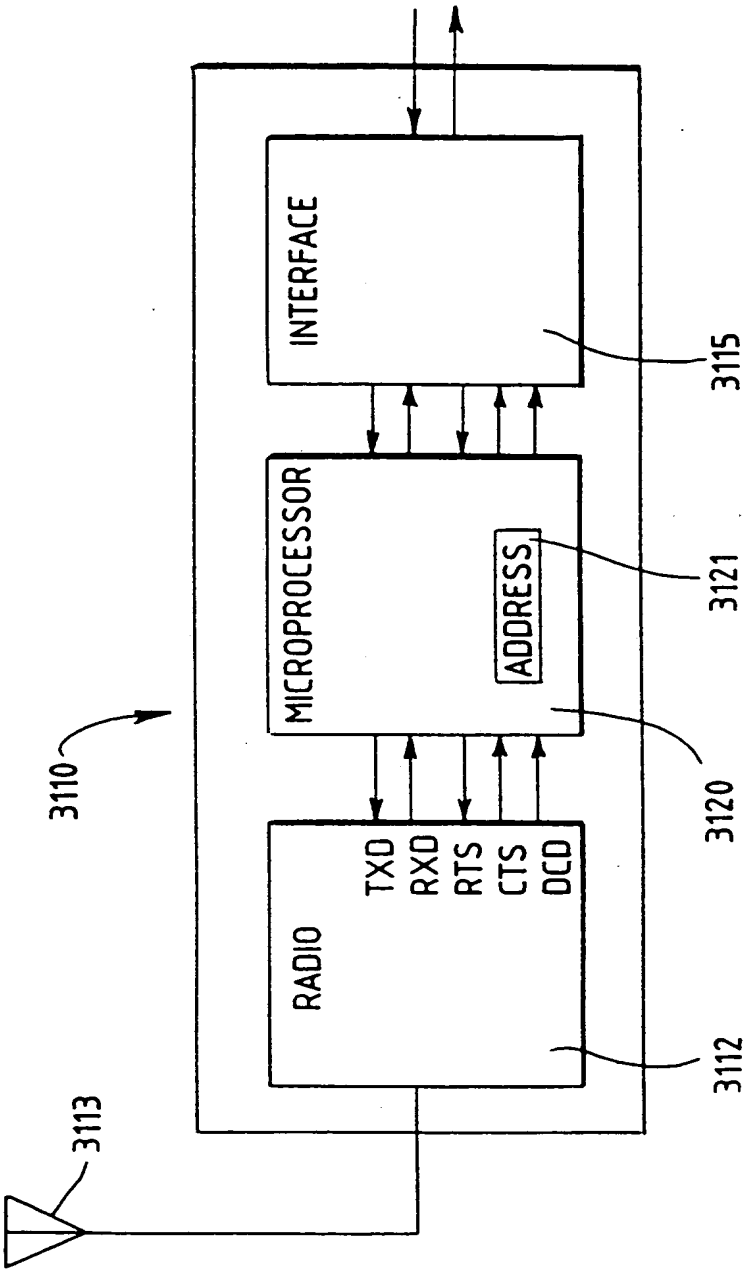

INTERFACE
3115
MICROPROCESSOR
ADDRESS
3121
3120
3110
TXD
RXD
RTS
CTS
DCD
RADIO
3112
3113

Figure 30

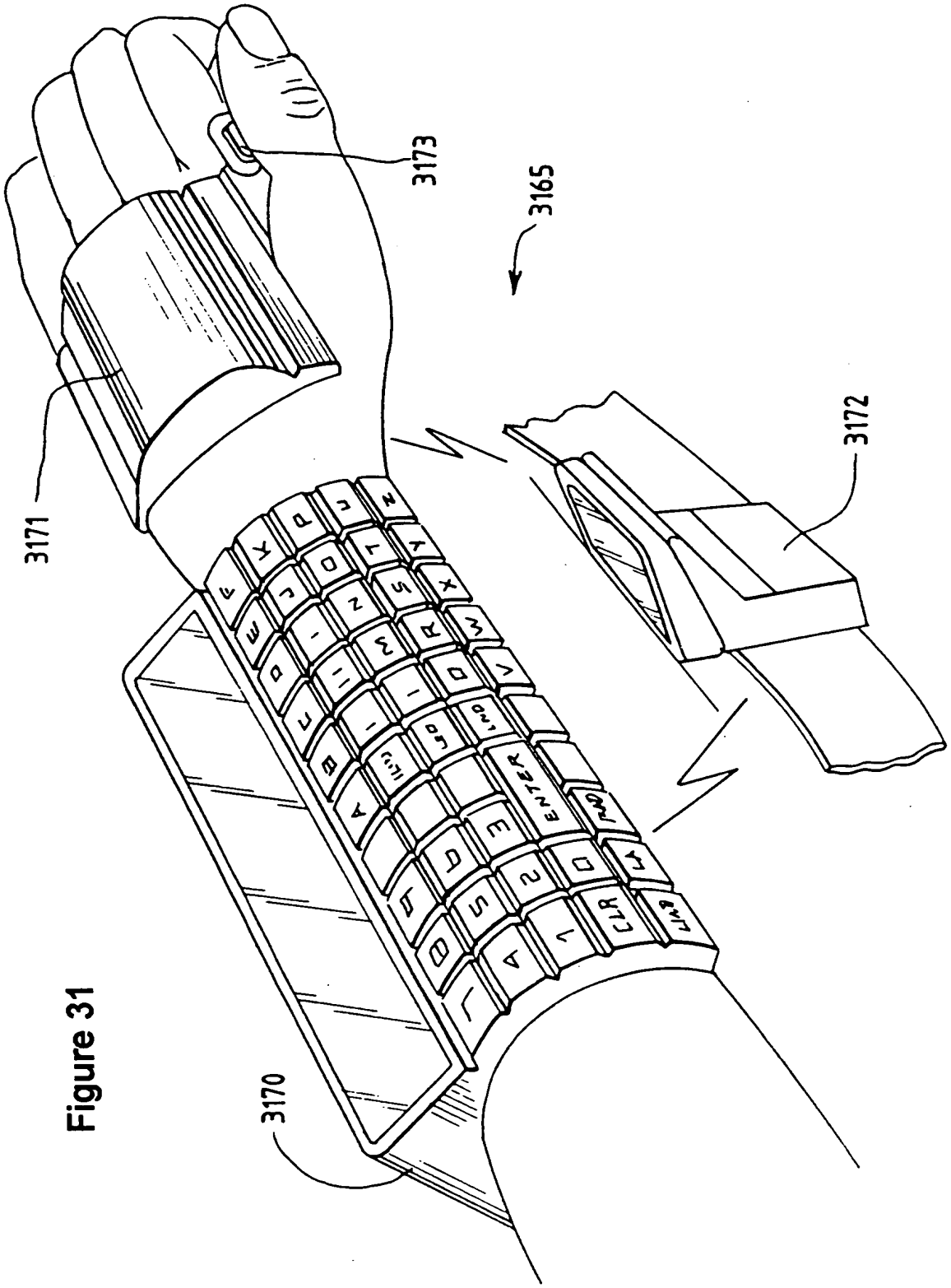
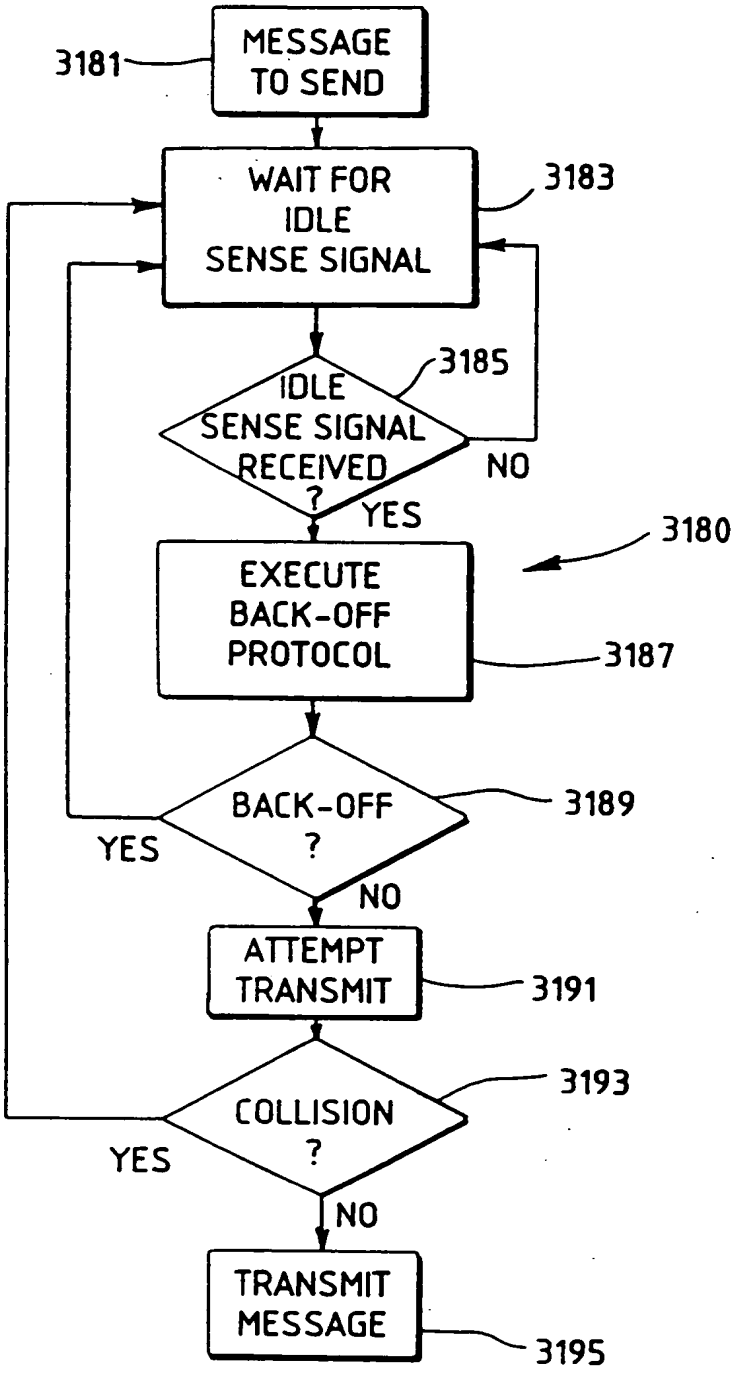


Figure 31

Figure 32


MESSAGE TO SEND
3181
WAIT FOR IDLE SENSE SIGNAL
3183
IDLE SENSE SIGNAL RECEIVED ?
3185
NO
YES
EXECUTE BACK-OFF PROTOCOL
3180
3187
BACK-OFF ?
3189
YES
NO
ATTEMPT TRANSMIT
3191
COLLISION ?
3193
YES
NO
TRANSMIT MESSAGE
3195

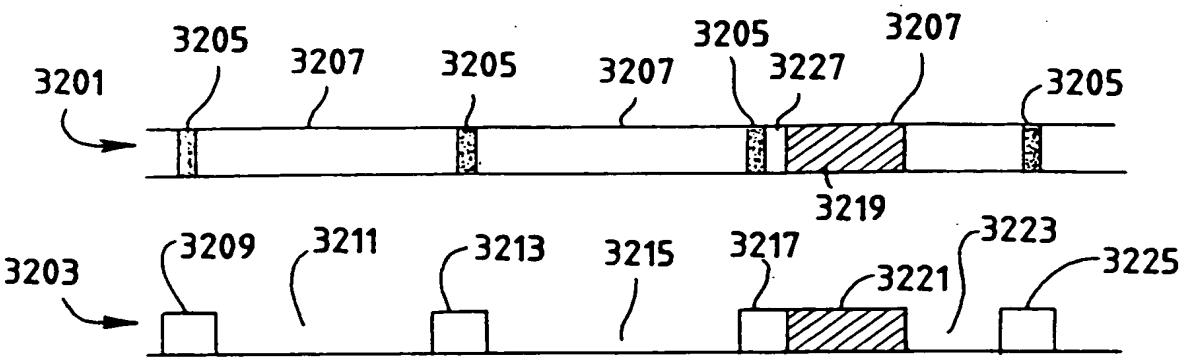


Figure 33A

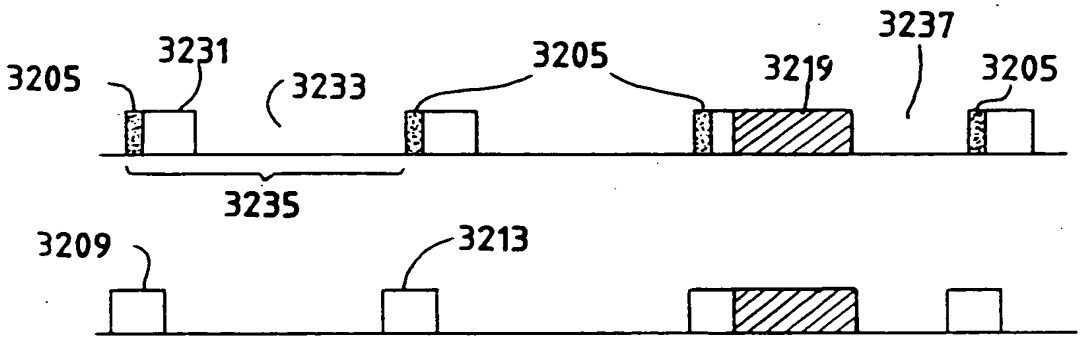


Figure 33B

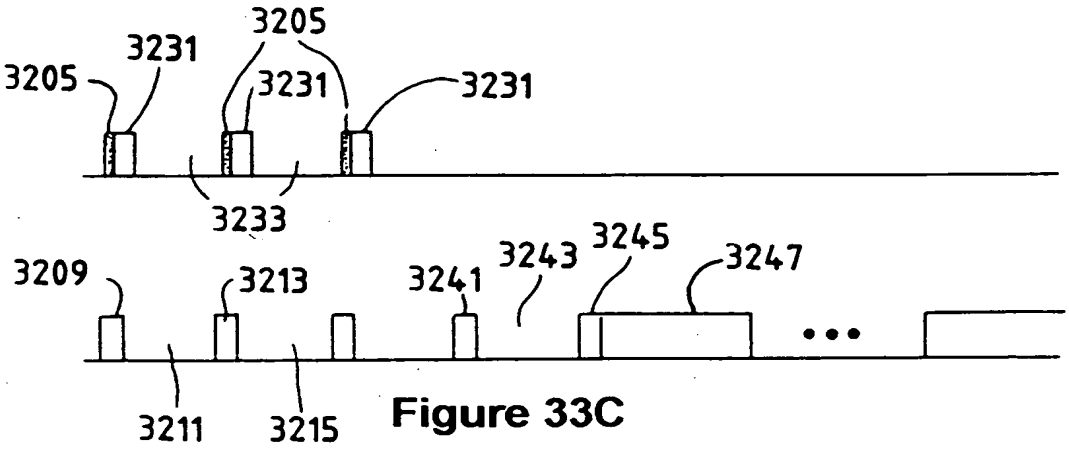


Figure 33C

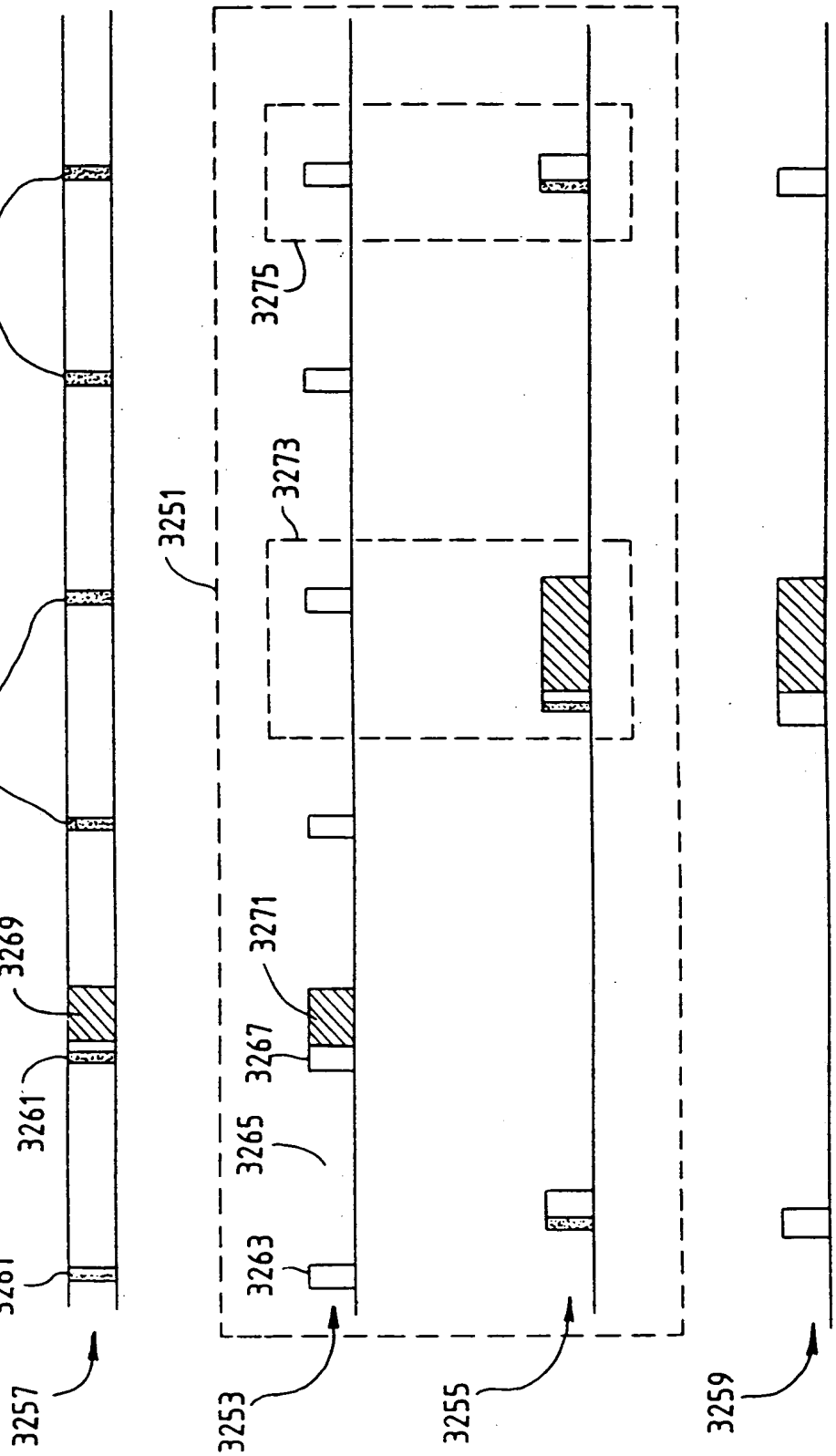

3261
3261
3261
3269
3261
3257
3251
3273
3275
3271
3267
3265
3263
3253
3255
3259

Figure 34

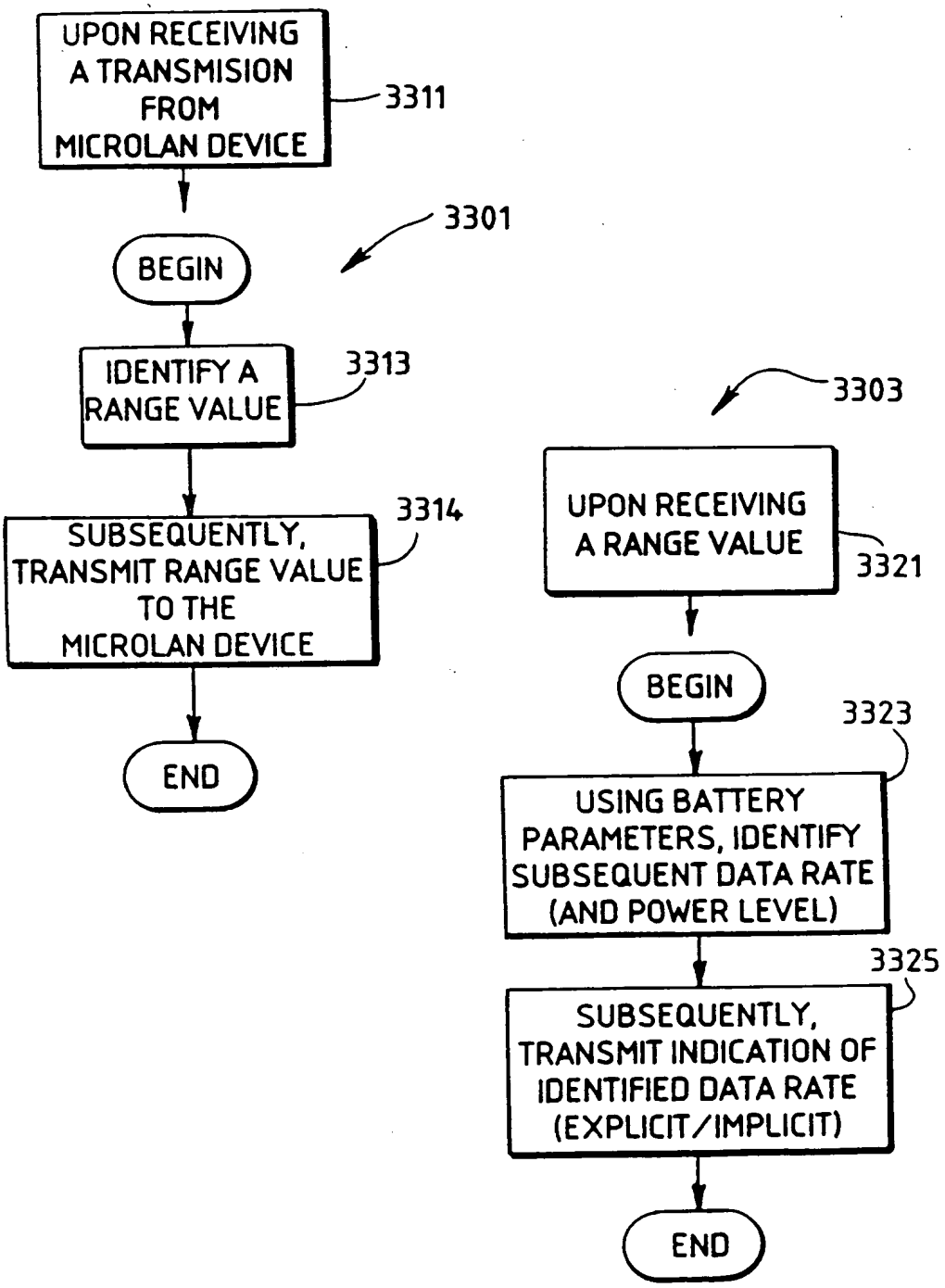
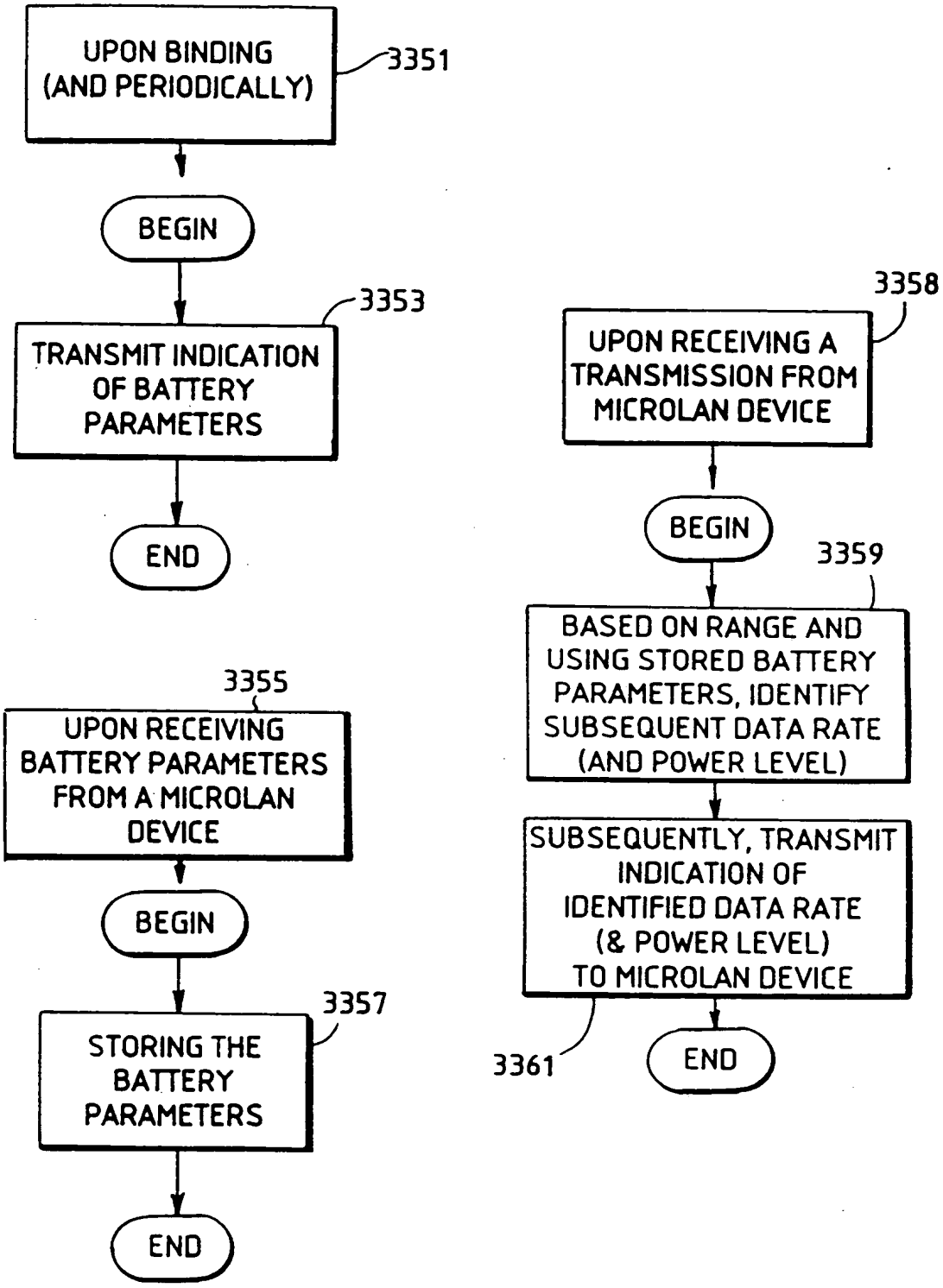

UPON RECEIVING A TRANSMISION FROM MICROLAN DEVICE
3311
3301
BEGIN
IDENTIFY A RANGE VALUE
3313
SUBSEQUENTLY, TRANSMIT RANGE VALUE TO THE MICROLAN DEVICE
3314
END
3303
UPON RECEIVING A RANGE VALUE
3321
BEGIN
3323
USING BATTERY PARAMETERS, IDENTIFY SUBSEQUENT DATA RATE (AND POWER LEVEL)
3325
SUBSEQUENTLY, TRANSMIT INDICATION OF IDENTIFIED DATA RATE (EXPLICIT/IMPLICIT)
END

Figure 35

Figure 36


UPON BINDING (AND PERIODICALLY)
3351
BEGIN
TRANSMIT INDICATION OF BATTERY PARAMETERS
3353
END
UPON RECEIVING BATTERY PARAMETERS FROM A MICROLAN DEVICE
3355
BEGIN
STORING THE BATTERY PARAMETERS
3357
END
UPON RECEIVING A TRANSMISSION FROM MICROLAN DEVICE
3358
BEGIN
BASED ON RANGE AND USING STORED BATTERY PARAMETERS, IDENTIFY SUBSEQUENT DATA RATE (AND POWER LEVEL)
3359
SUBSEQUENTLY, TRANSMIT INDICATION OF IDENTIFIED DATA RATE (& POWER LEVEL) TO MICROLAN DEVICE
3361
END

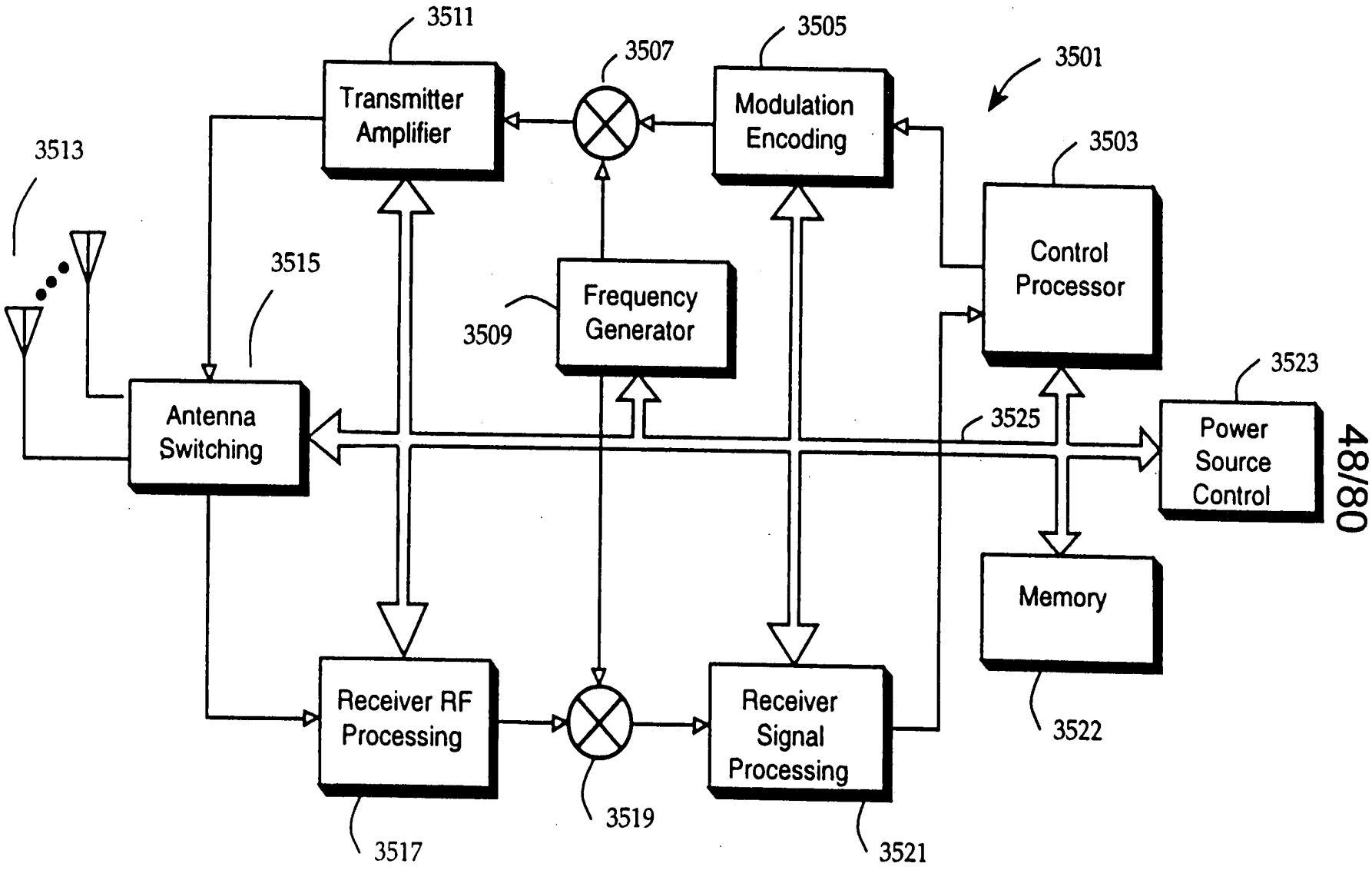

3511
3507
3505
3501
Transmitter Amplifier
Modulation Encoding
3513
3503
Control Processor
3515
Frequency Generator
3509
Antenna Switching
3523
3525
Power Source Control
48/80
Memory
Receiver RF Processing
Receiver Signal Processing
3522
3519
3517
3521

Figure 37

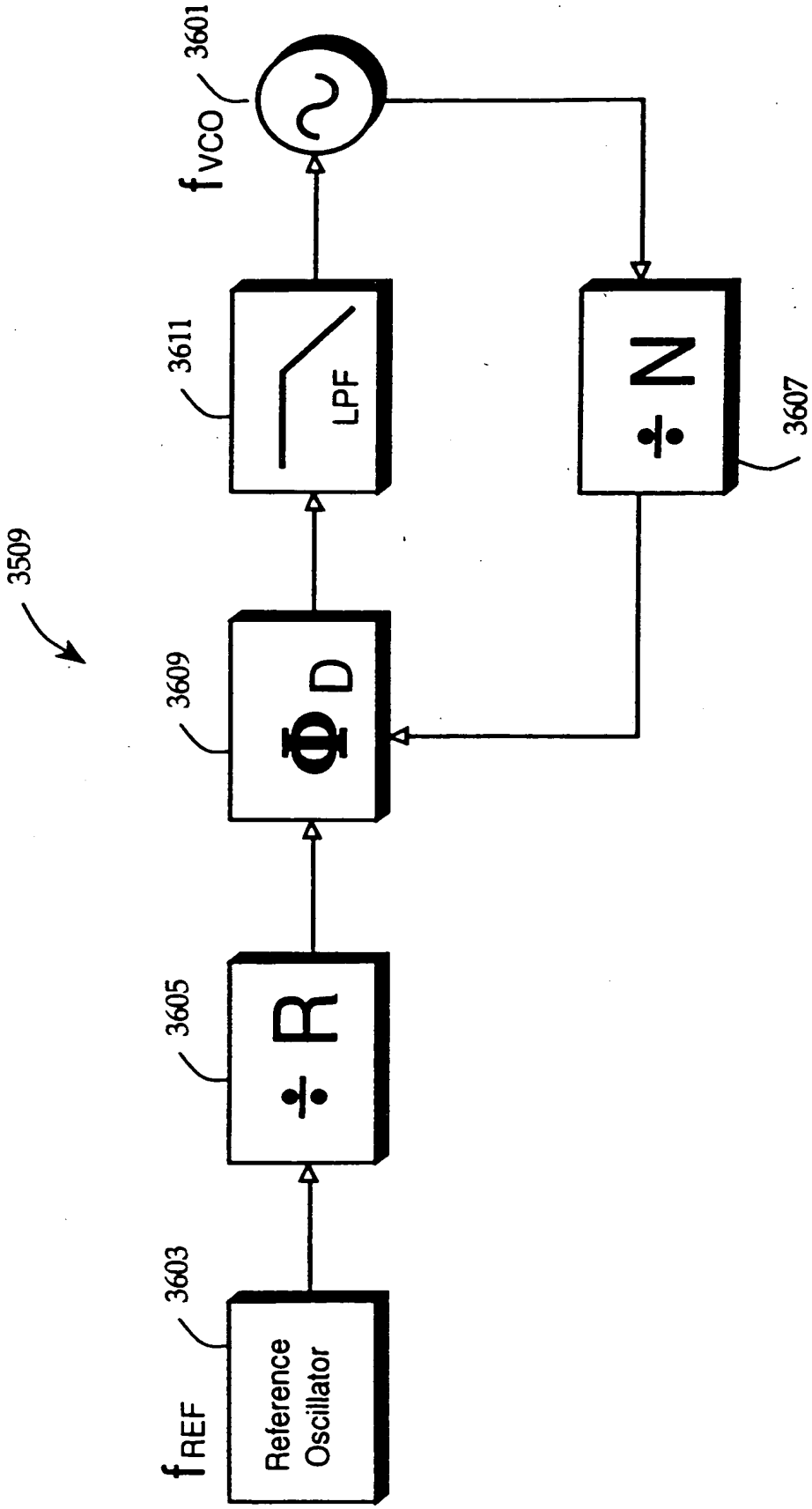

3509
3601
f_{VCO}
3611
LPF
÷ N
3607
3609
Φ D
3605
÷ R
3603
Reference Oscillator
f_{REF}

Figure 38

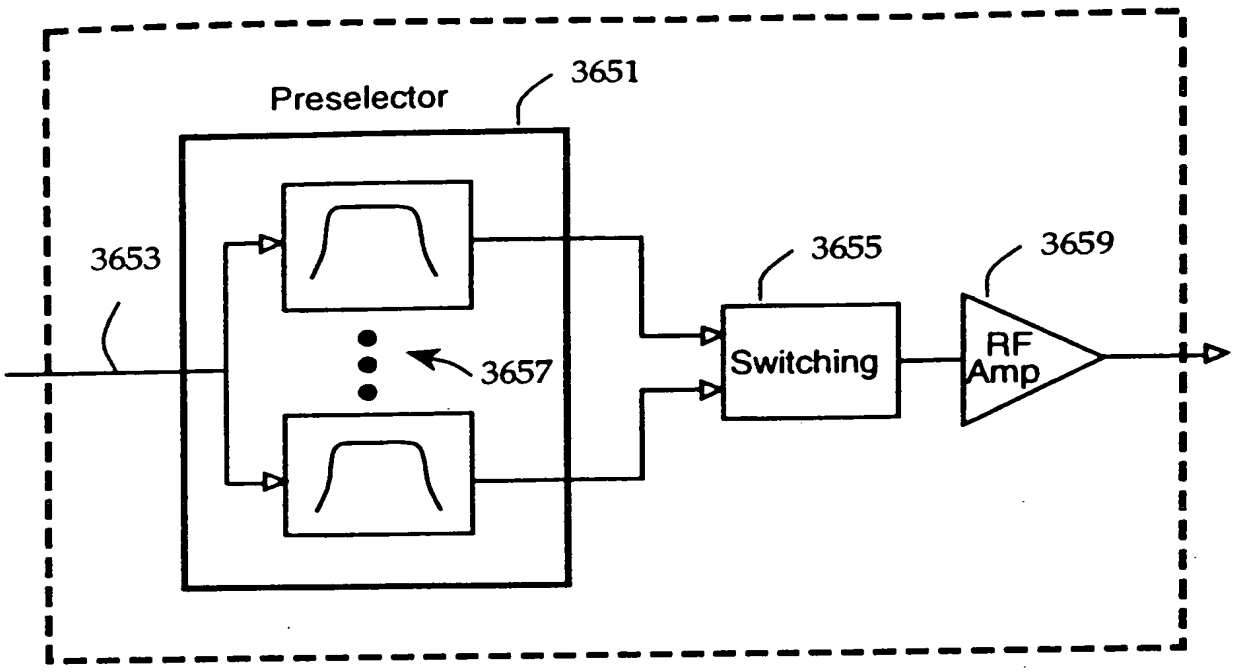


Figure 39

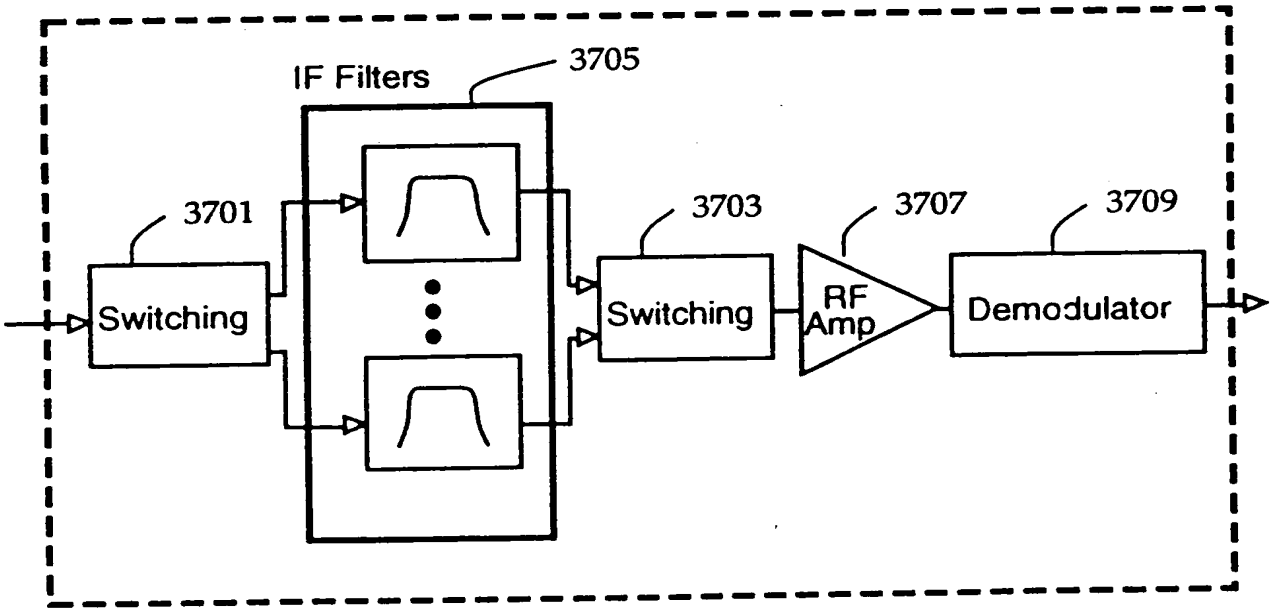


Figure 40

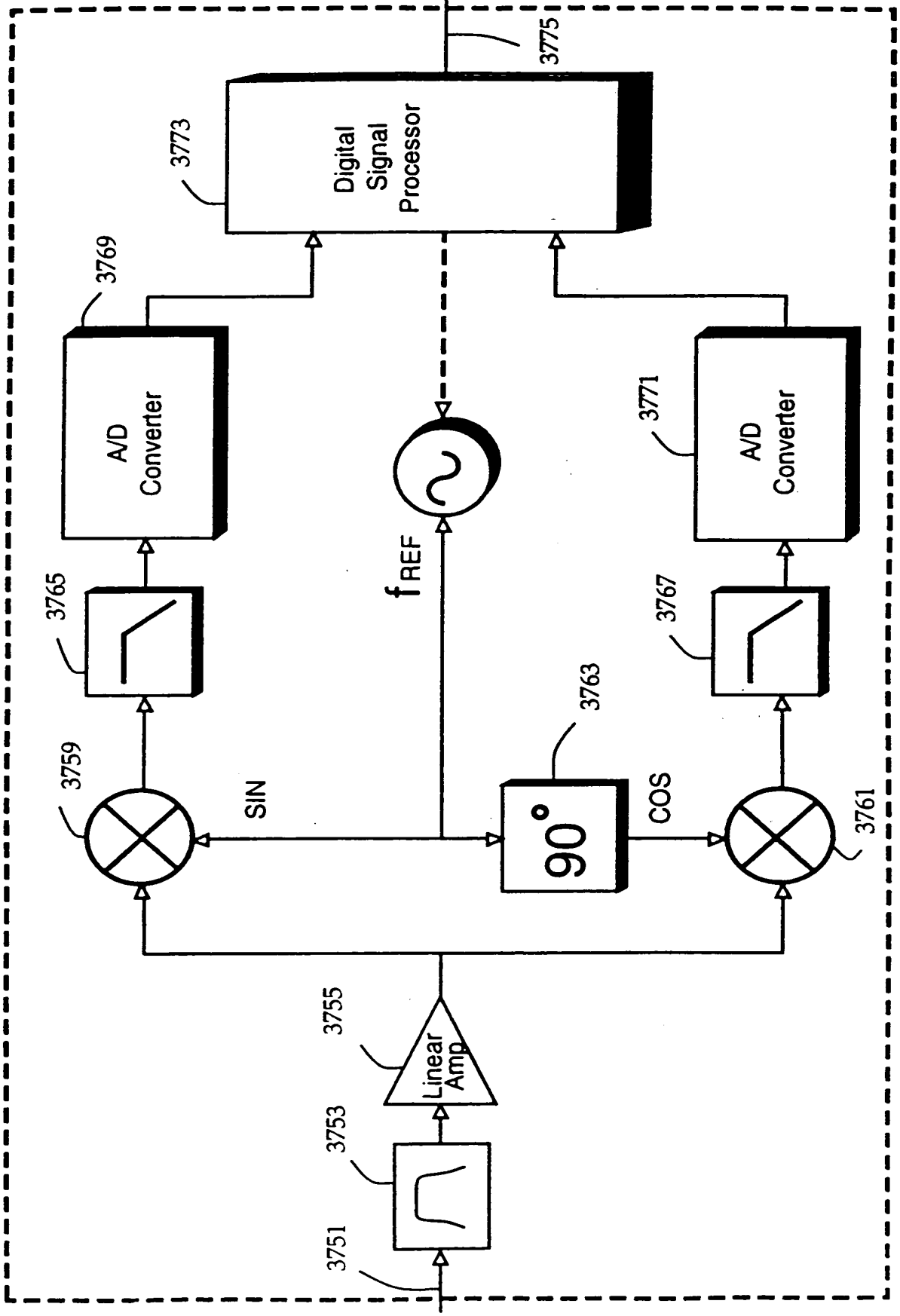

3775
3773
Digital Signal Processor
3769
A/D Converter
3771
A/D Converter
f_{REF}
3765
3767
3759
3763
SIN
90°
COS
3761
3755
Linear Amp
3753
3751

Figure 41

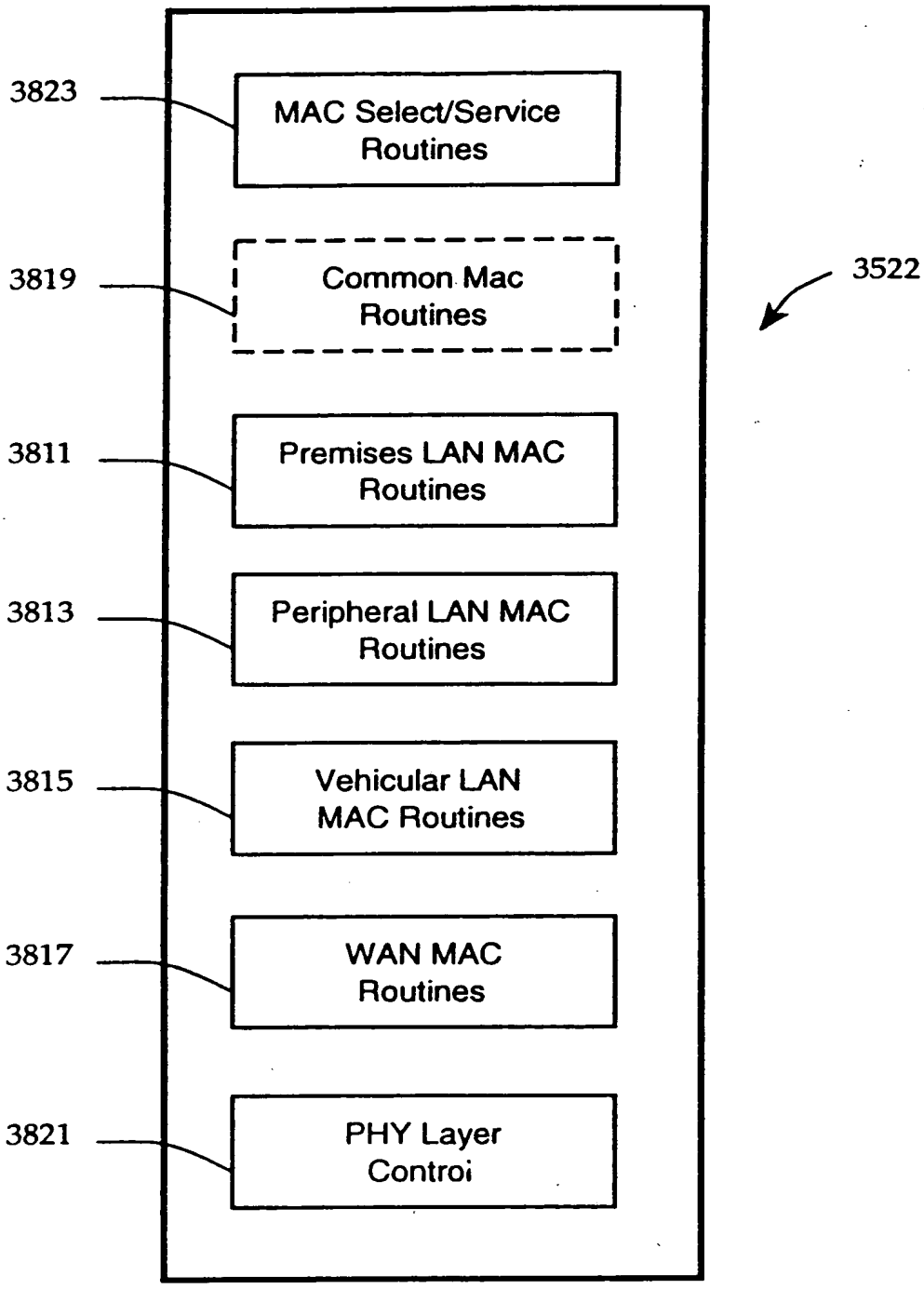

3823
MAC Select/Service Routines
3819
Common Mac Routines
3522
3811
Premises LAN MAC Routines
3813
Peripheral LAN MAC Routines
3815
Vehicular LAN MAC Routines
3817
WAN MAC Routines
3821
PHY Layer Control

Figure 42

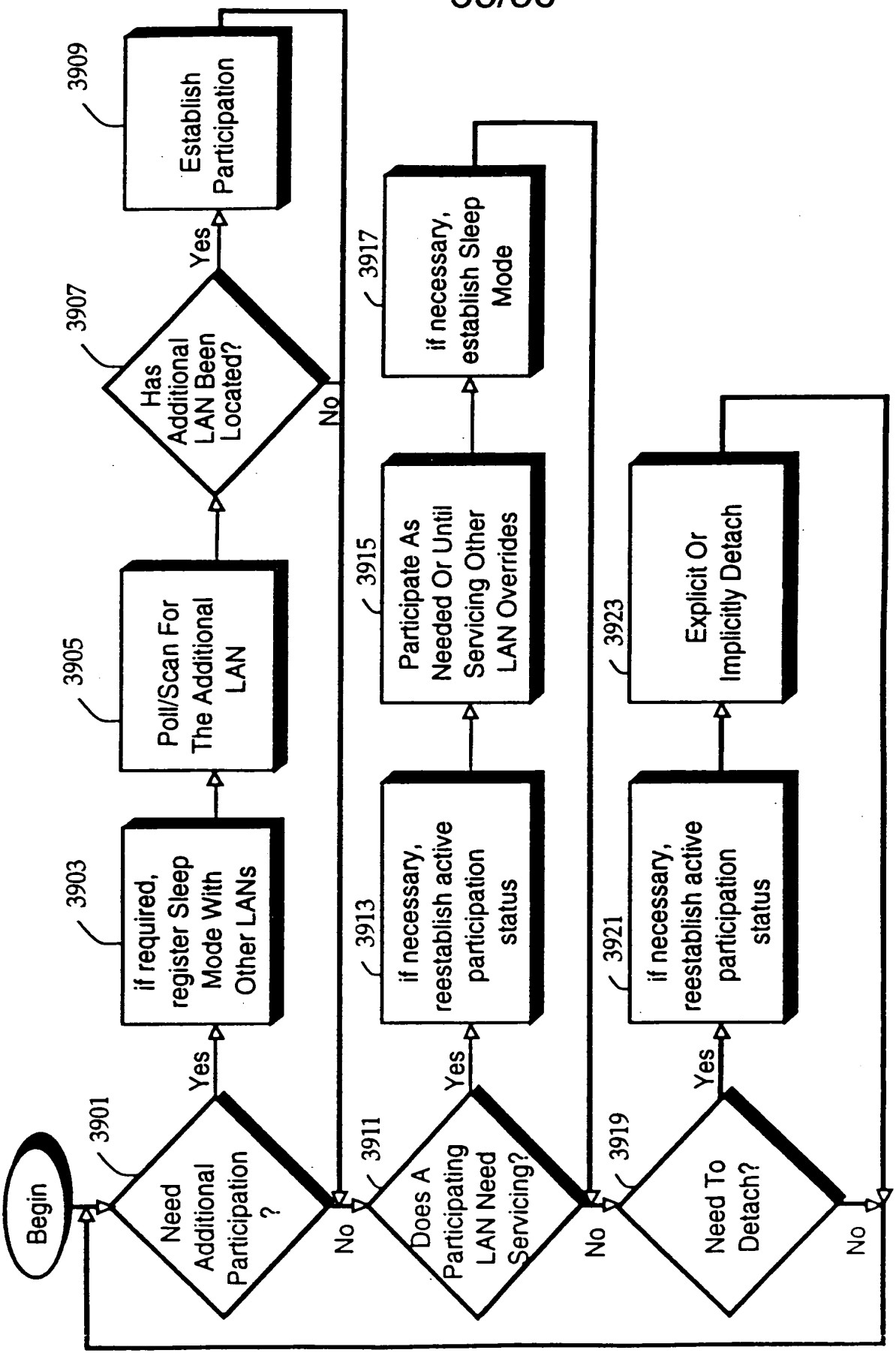

Begin
3901
Need Additional Participation ?
Yes
No
3903
if required, register Sleep Mode With Other LANs
3905
Poll/Scan For The Additional LAN
3907
Has Additional LAN Been Located?
Yes
No
3909
Establish Participation
3911
Does A Participating LAN Need Servicing?
Yes
No
3913
if necessary, reestablish active participation status
3915
Participate As Needed Or Until Servicing Other LAN Overrides
3917
if necessary, establish Sleep Mode
3919
Need To Detach?
Yes
No
3921
if necessary, reestablish active participation status
3923
Explicit Or Implicitly Detach

Figure 43

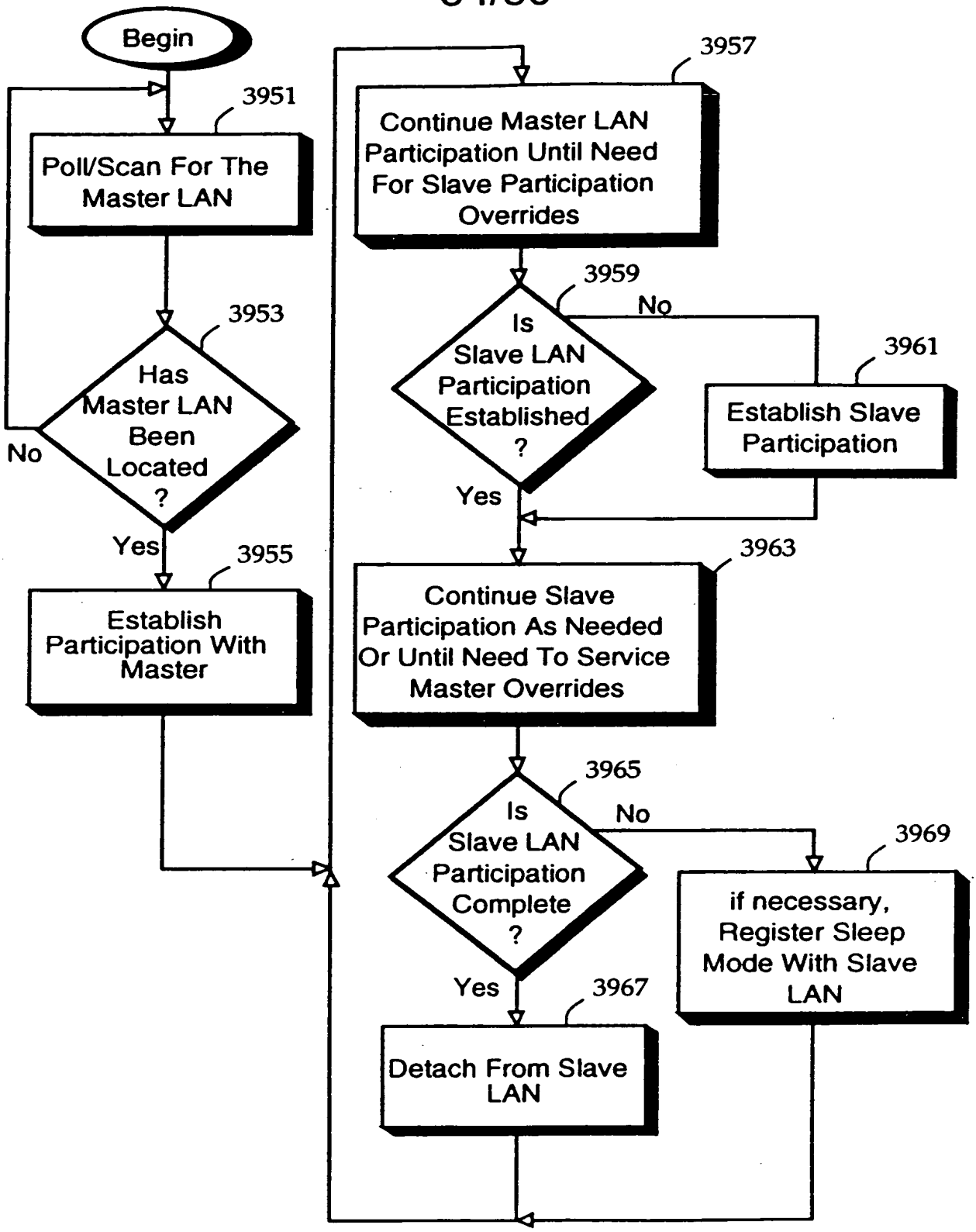

Begin
3951
Poll/Scan For The Master LAN
3953
Has Master LAN Been Located ?
No
Yes
3955
Establish Participation With Master
3957
Continue Master LAN Participation Until Need For Slave Participation Overrides
3959
Is Slave LAN Participation Established ?
No
3961
Establish Slave Participation
Yes
3963
Continue Slave Participation As Needed Or Until Need To Service Master Overrides
3965
Is Slave LAN Participation Complete ?
No
3969
if necessary, Register Sleep Mode With Slave LAN
Yes
3967
Detach From Slave LAN

Figure 44

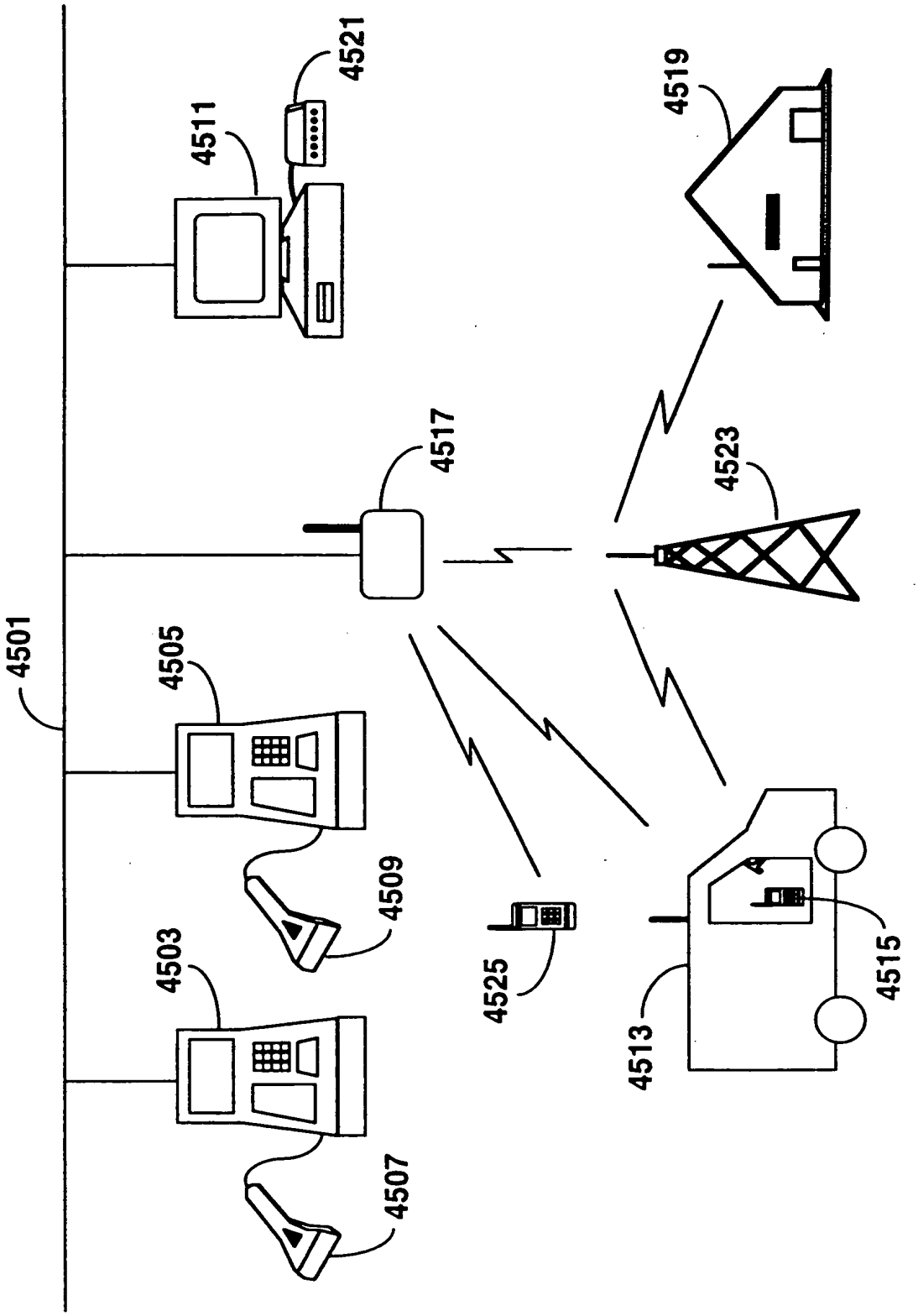

4501
4503
4505
4507
4509
4511
4513
4515
4517
4519
4521
4523
4525

Figure 45

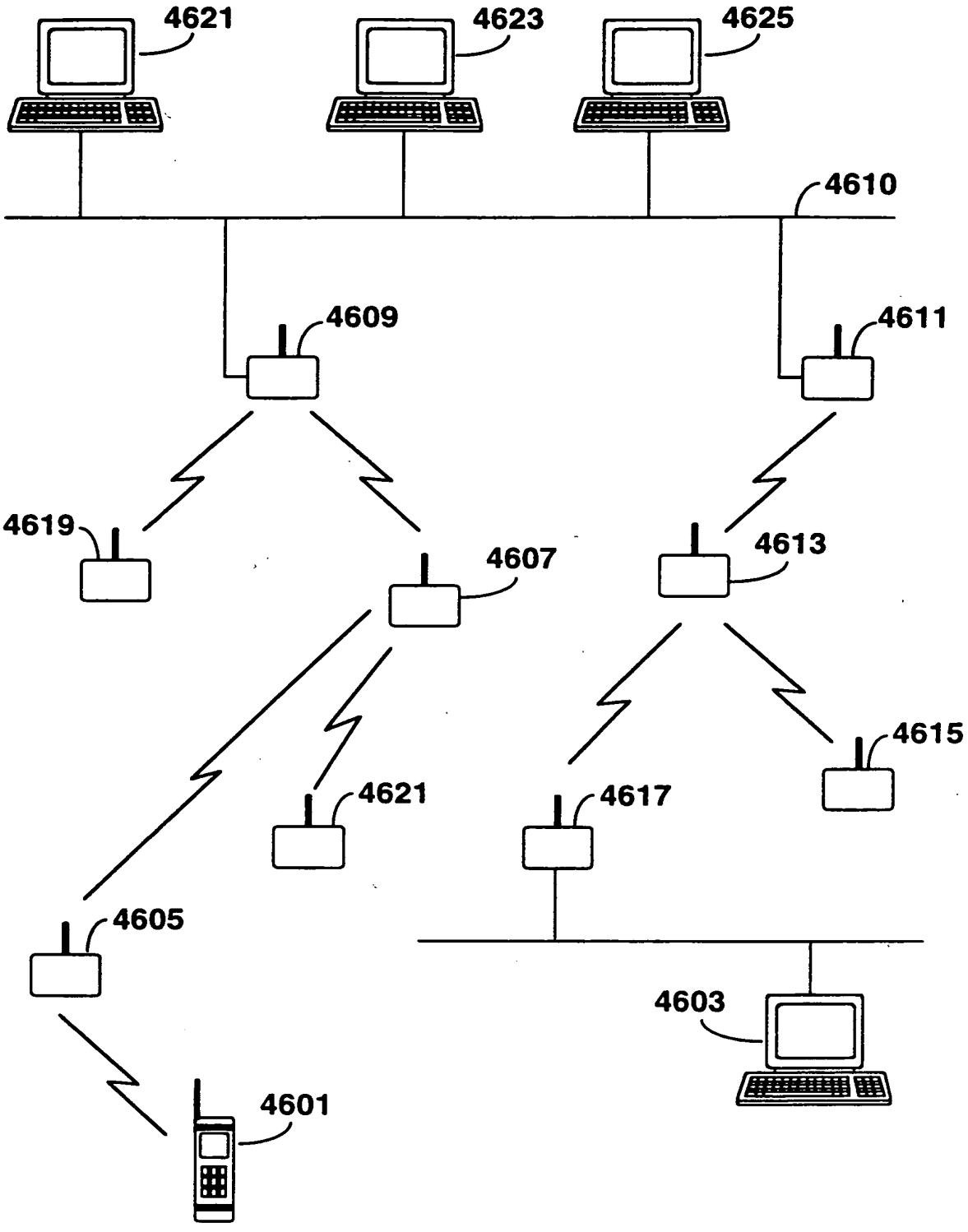

4621
4623
4625
4610
4609
4611
4619
4607
4613
4615
4621
4617
4605
4603
4601

Figure 46a

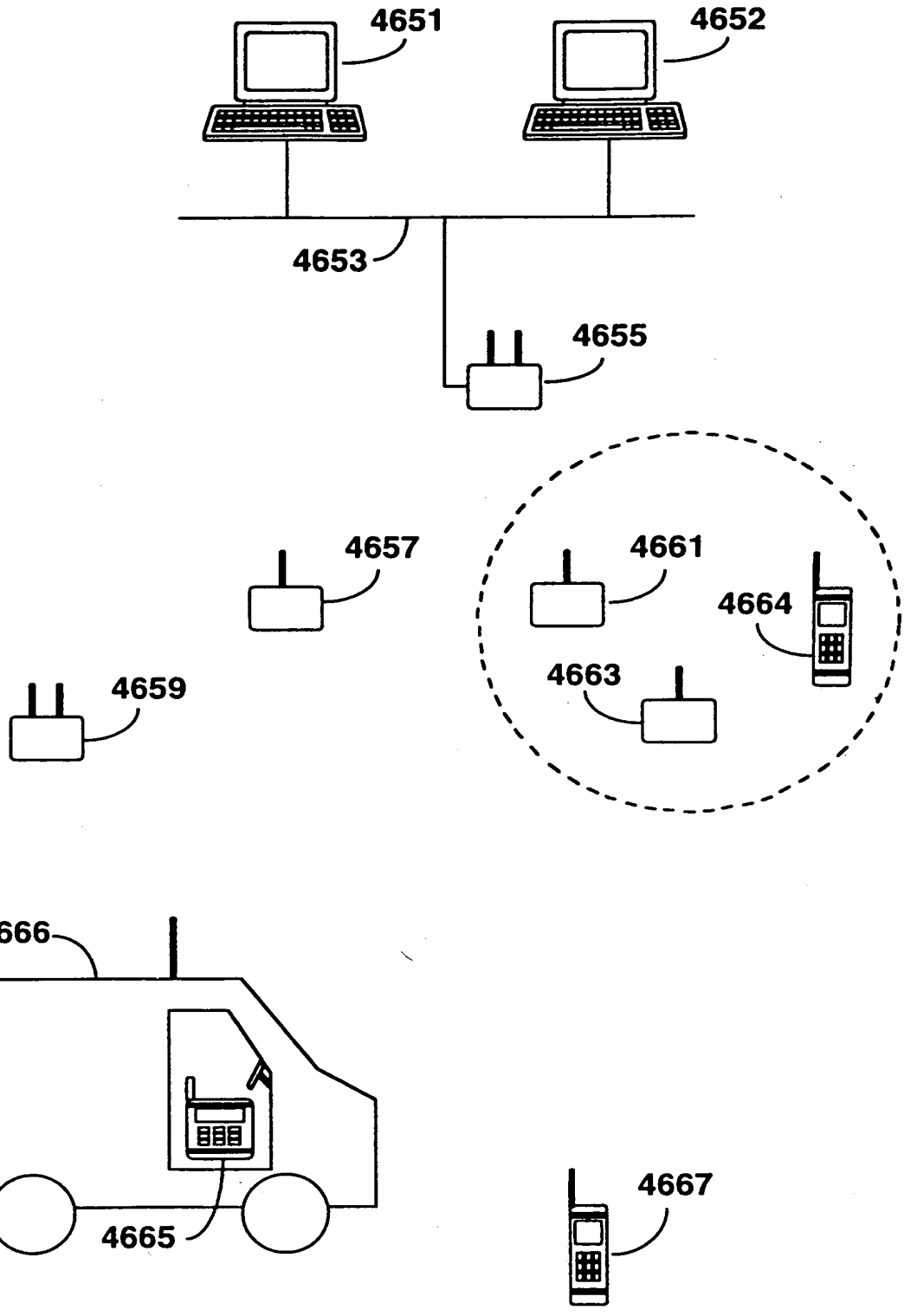


Figure 46b

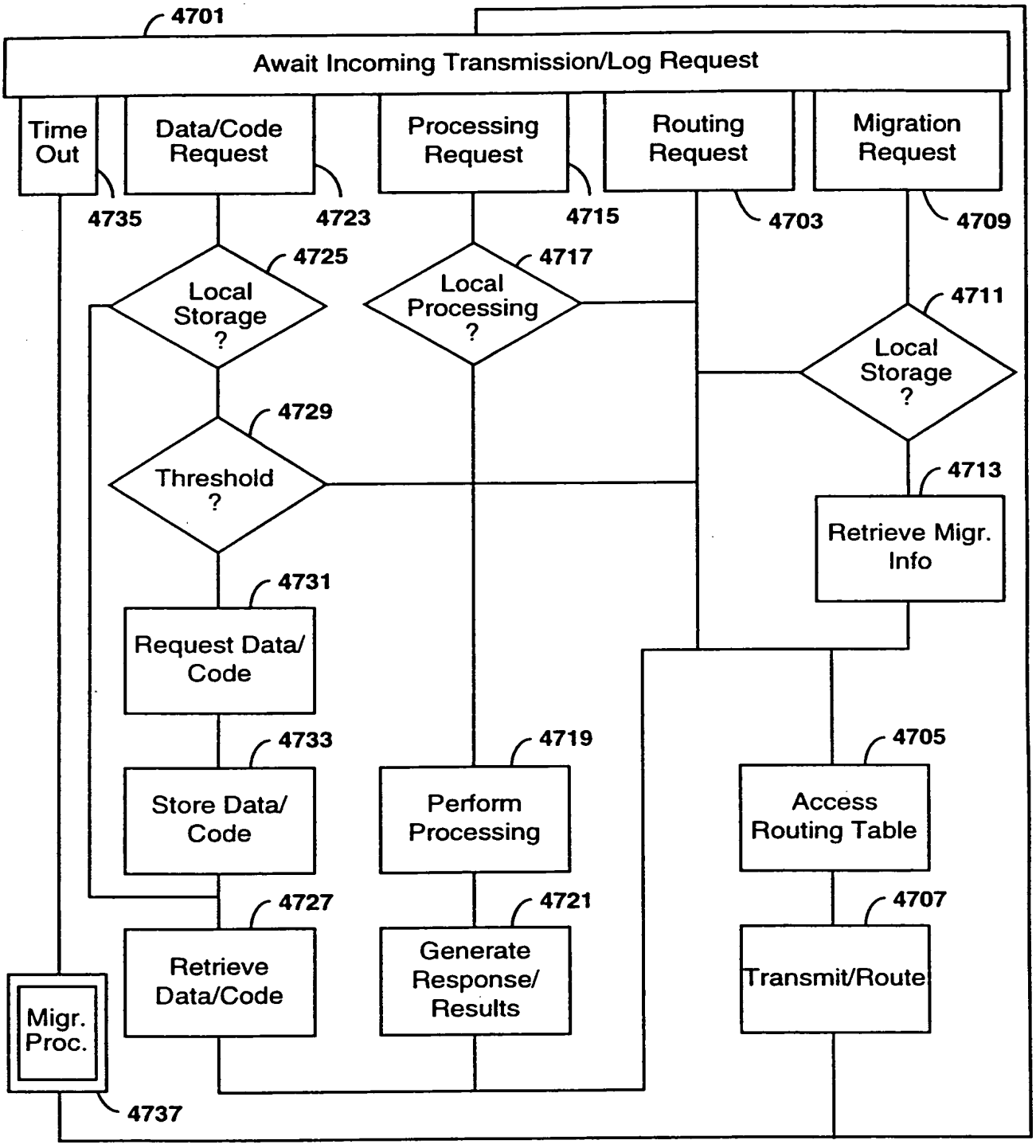

4701
Await Incoming Transmission/Log Request
Time Out
Data/Code Request
Processing Request
Routing Request
Migration Request
4735
4723
4715
4703
4709
4725
Local Storage ?
4717
Local Processing ?
4711
Local Storage ?
4729
Threshold ?
4713
Retrieve Migr. Info
4731
Request Data/ Code
4733
Store Data/ Code
4719
Perform Processing
4705
Access Routing Table
4727
Retrieve Data/Code
4721
Generate Response/ Results
4707
Transmit/Route
Migr. Proc.
4737

Figure 47a

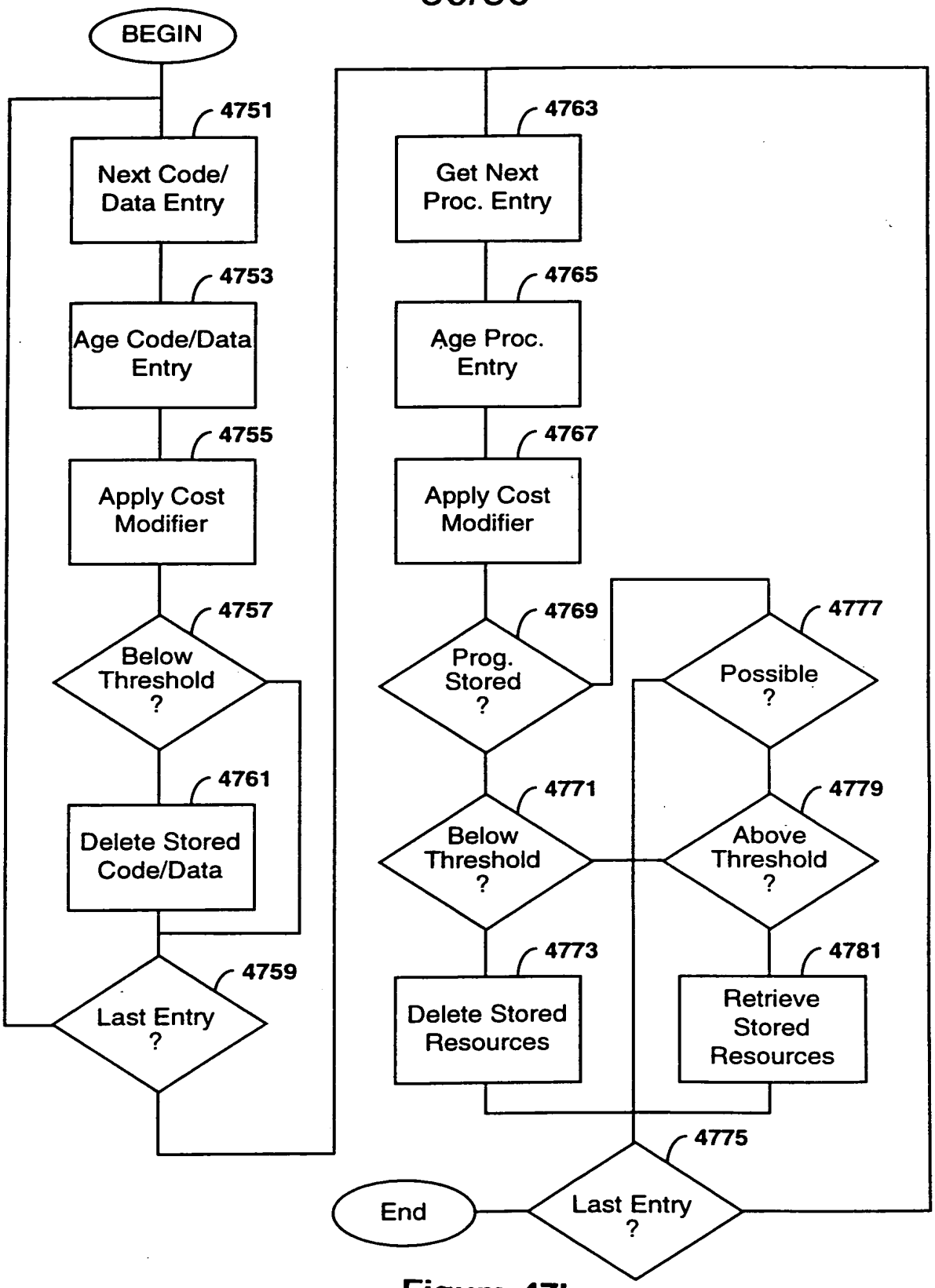

BEGIN
4751
Next Code/ Data Entry
4753
Age Code/Data Entry
4755
Apply Cost Modifier
4757
Below Threshold ?
4761
Delete Stored Code/Data
4759
Last Entry ?
4763
Get Next Proc. Entry
4765
Age Proc. Entry
4767
Apply Cost Modifier
4769
Prog. Stored ?
4777
Possible ?
4771
Below Threshold ?
4779
Above Threshold ?
4773
Delete Stored Resources
4781
Retrieve Stored Resources
4775
Last Entry ?
End

Figure 47b

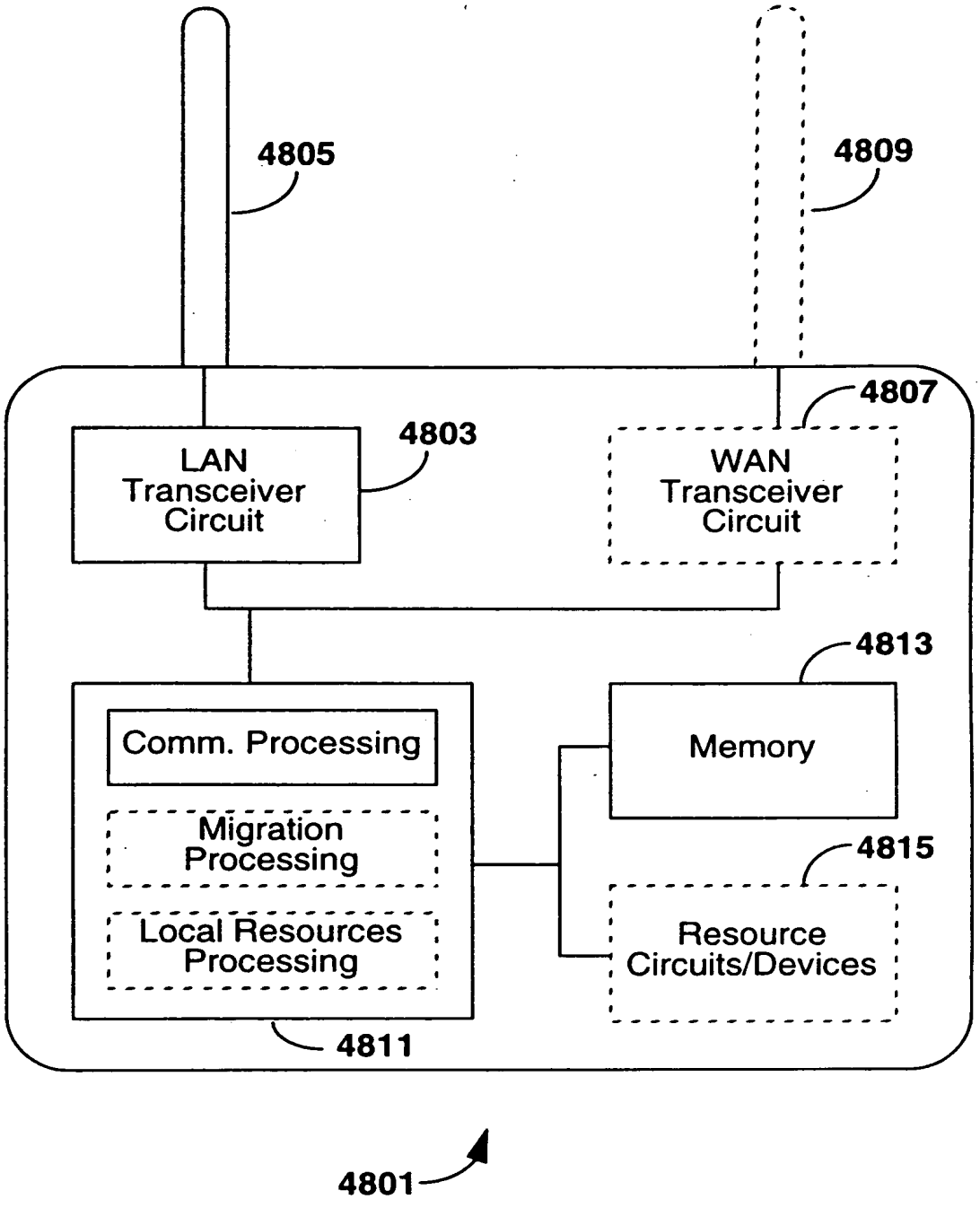

4805
4809
4807
4803
LAN Transceiver Circuit
WAN Transceiver Circuit
4813
Comm. Processing
Migration Processing
Local Resources Processing
Memory
4815
Resource Circuits/Devices
4811
4801

Figure 48

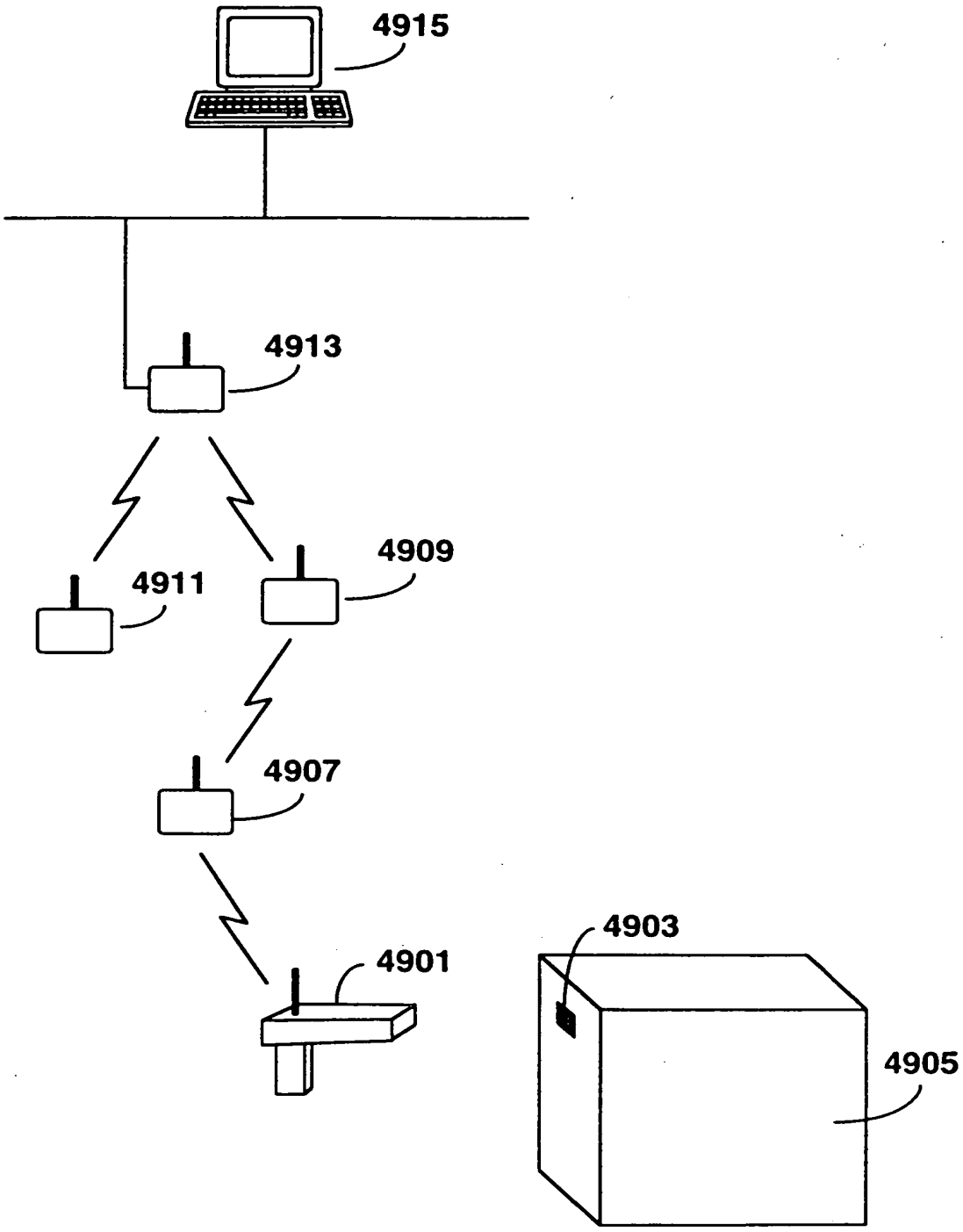


Figure 49a

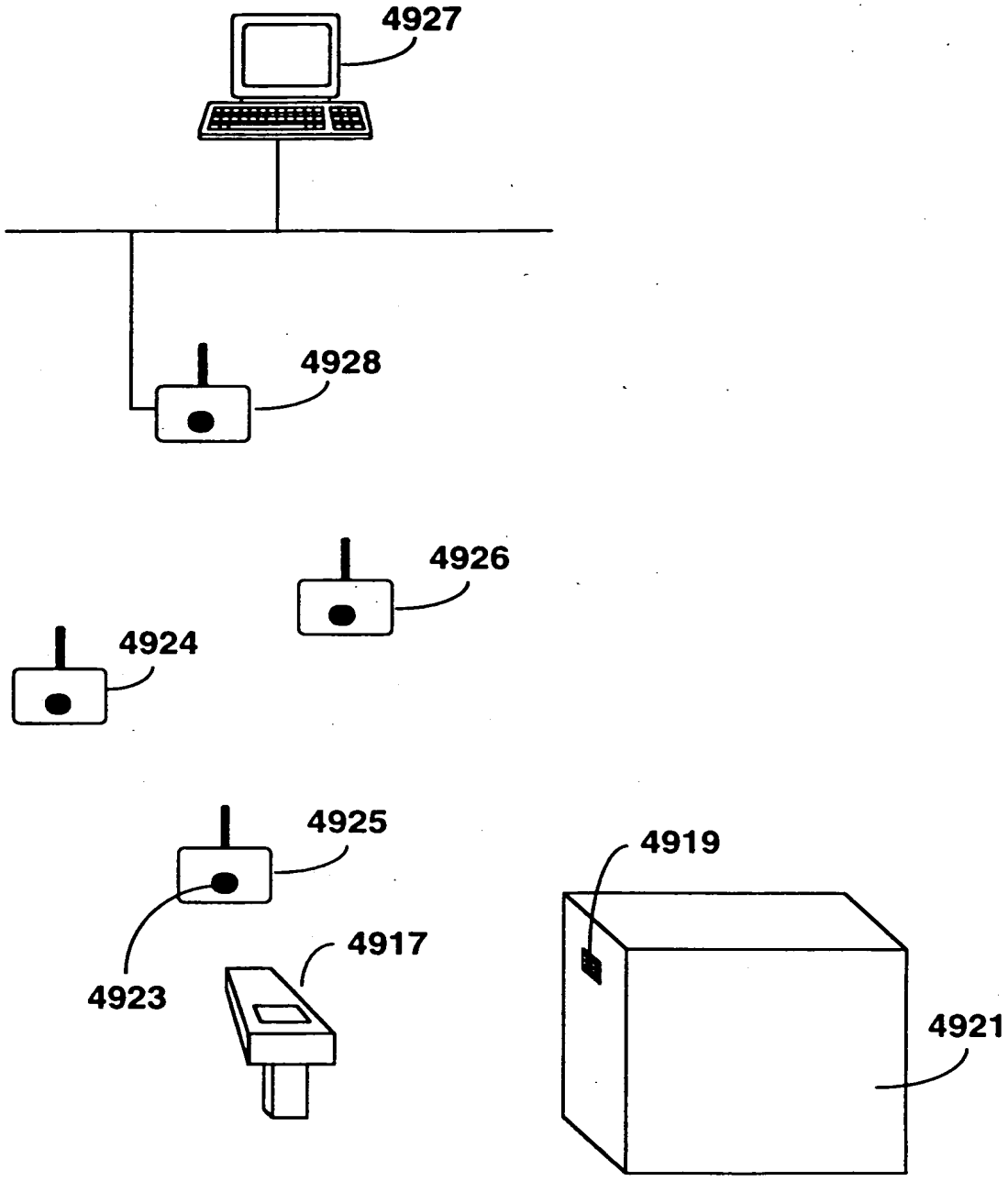


Figure 49b

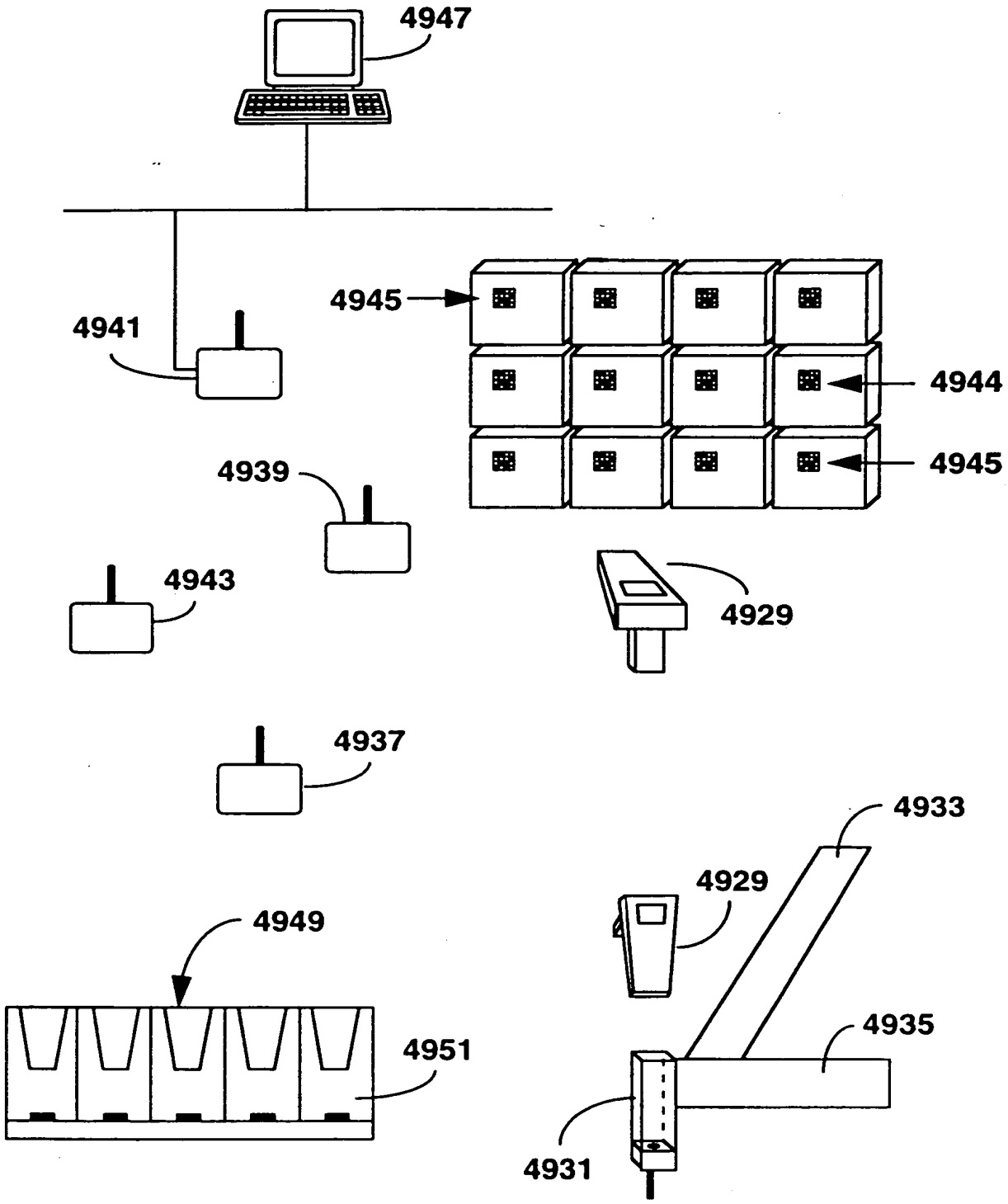

4947
4941
4945
4944
4945
4939
4943
4929
4937
4933
4929
4949
4935
4951
4931

Figure 49c

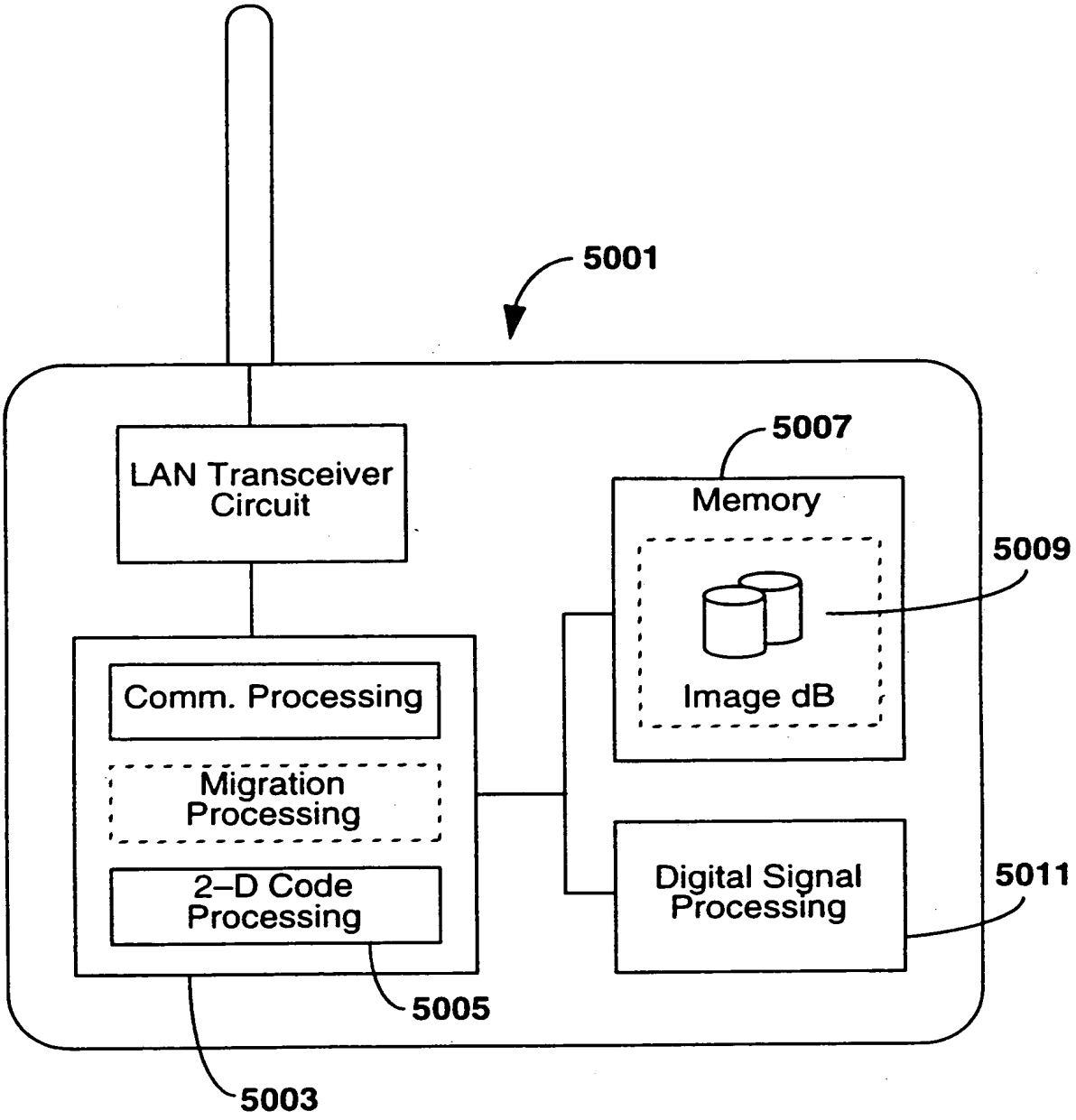

5001
LAN Transceiver Circuit
5007
Memory
5009
Image dB
Comm. Processing
Migration Processing
2–D Code Processing
Digital Signal Processing
5011
5005
5003

Figure 50

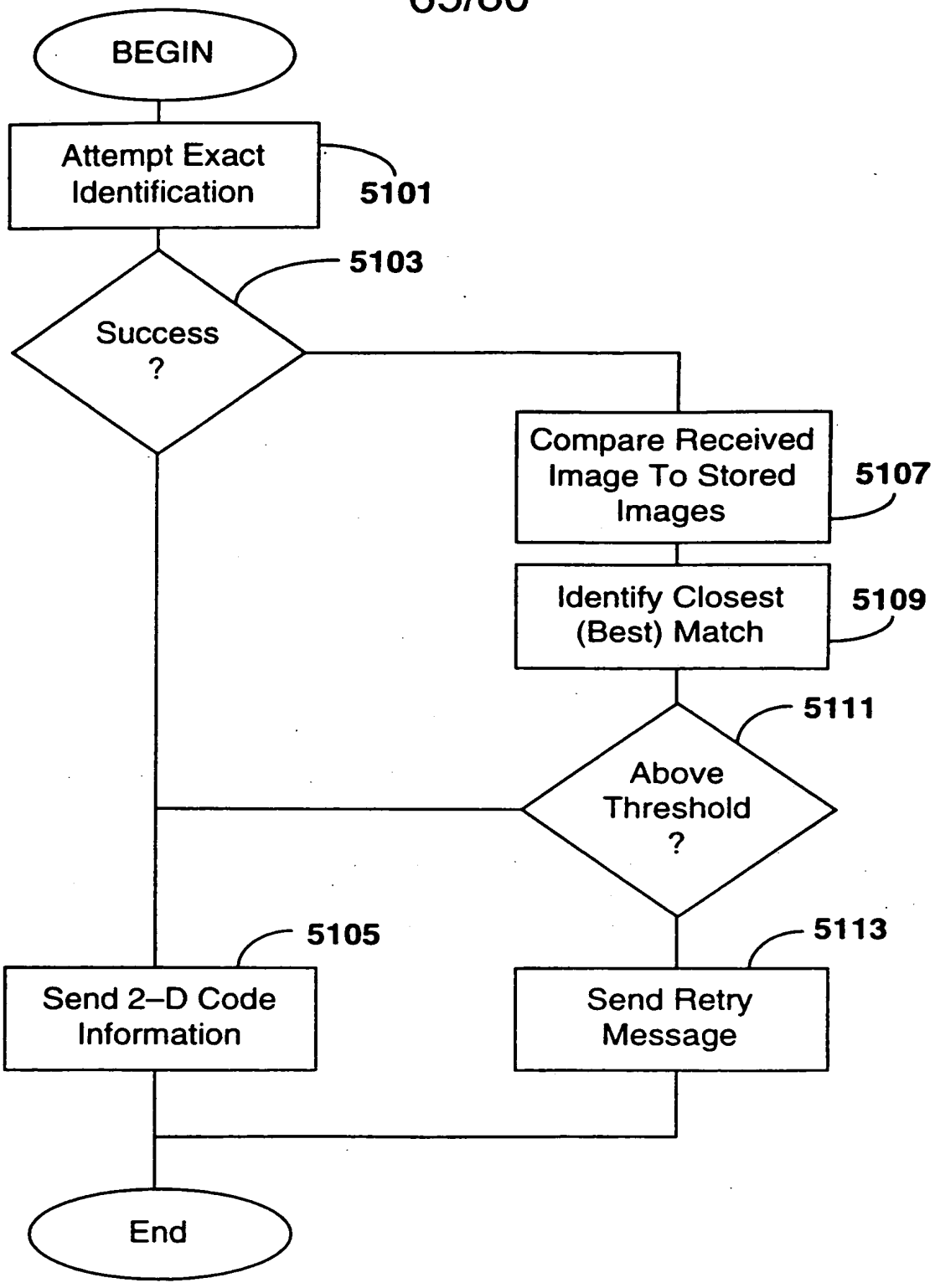

BEGIN
Attempt Exact Identification
5101
5103
Success ?
Compare Received Image To Stored Images
5107
Identify Closest (Best) Match
5109
5111
Above Threshold ?
5105
Send 2–D Code Information
5113
Send Retry Message
End

Figure 51a

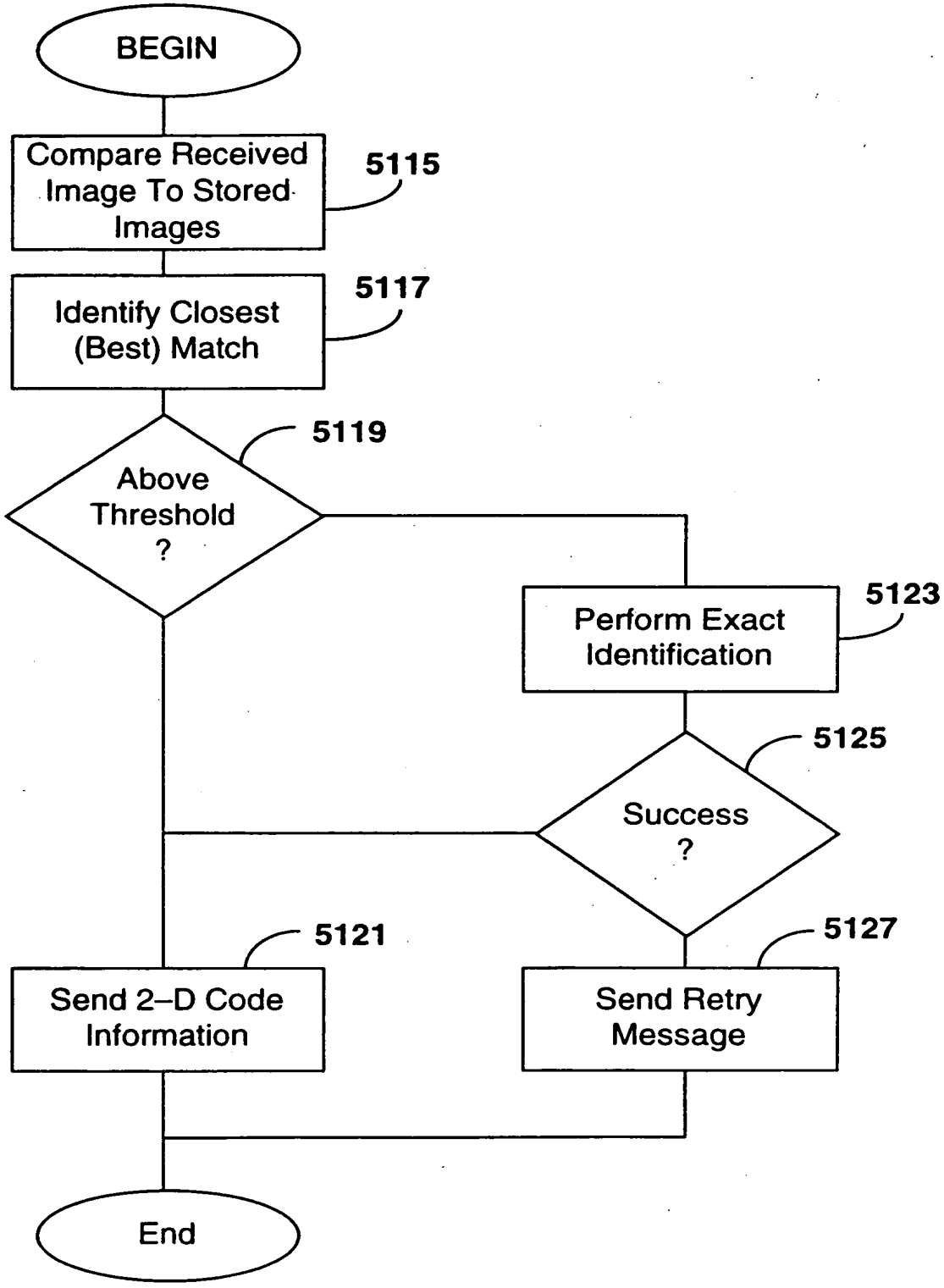

BEGIN
Compare Received Image To Stored Images
5115
Identify Closest (Best) Match
5117
Above Threshold ?
5119
Perform Exact Identification
5123
Success ?
5125
Send 2–D Code Information
5121
Send Retry Message
5127
End

Figure 51b

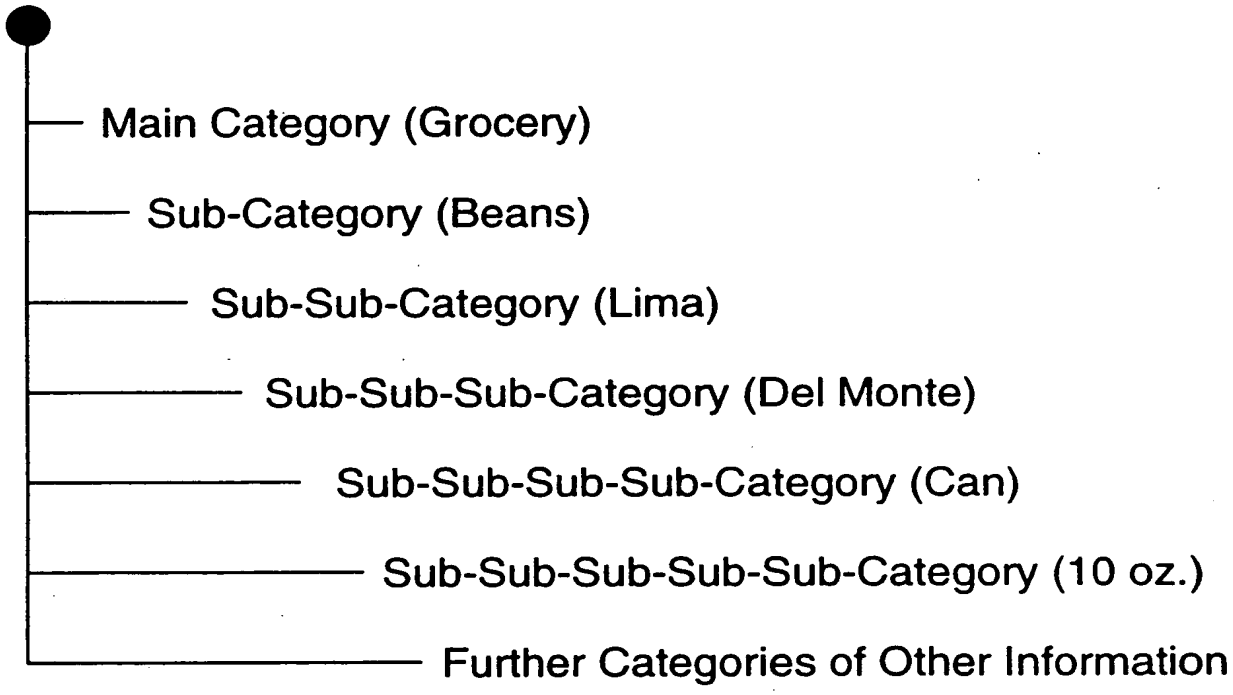

Main Category (Grocery)
Sub-Category (Beans)
Sub-Sub-Category (Lima)
Sub-Sub-Sub-Category (Del Monte)
Sub-Sub-Sub-Sub-Category (Can)
Sub-Sub-Sub-Sub-Sub-Category (10 oz.)
Further Categories of Other Information

Figure 52

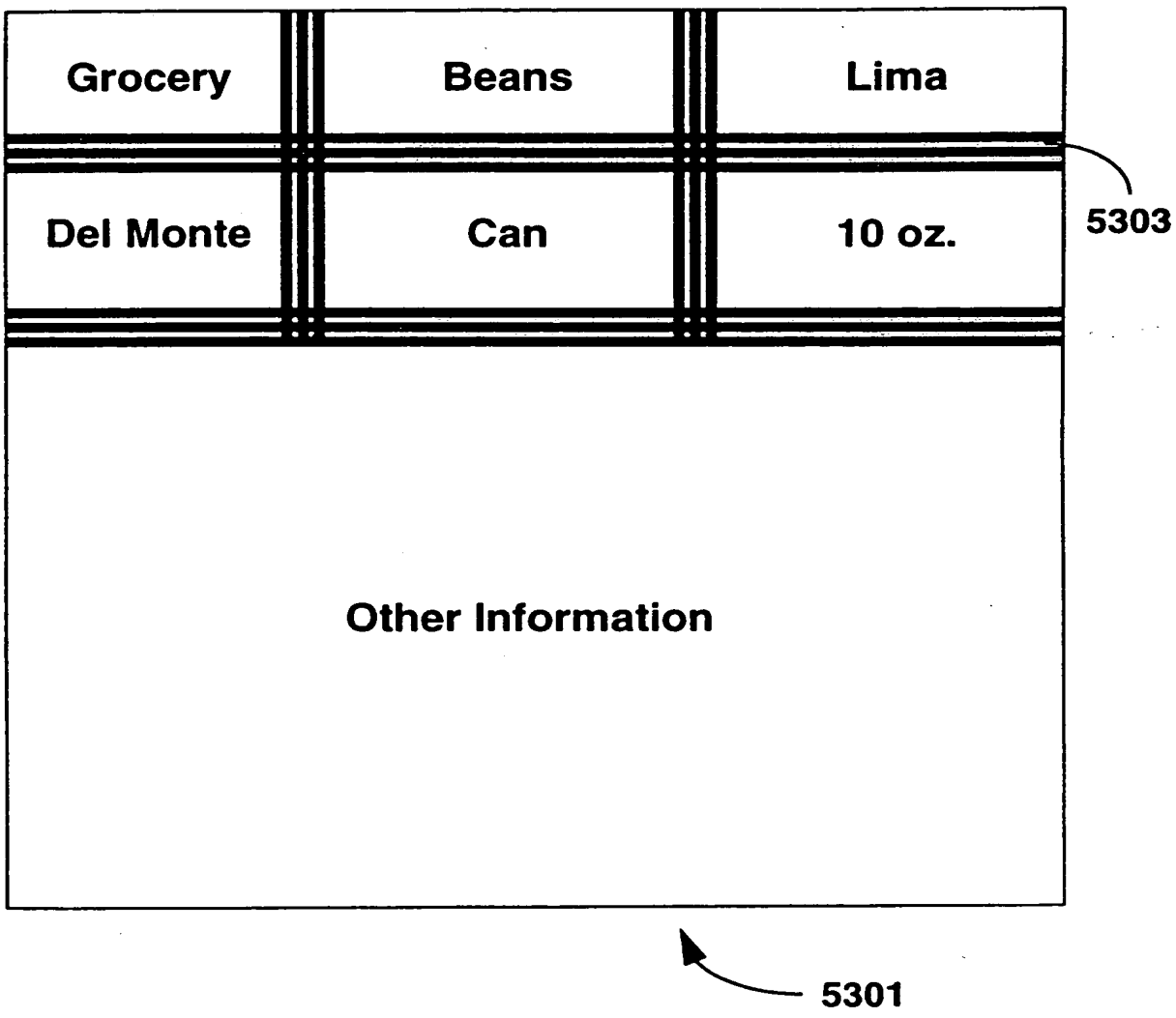

Grocery
Beans
Lima
Del Monte
Can
10 oz.
5303
Other Information
5301

Figure 53

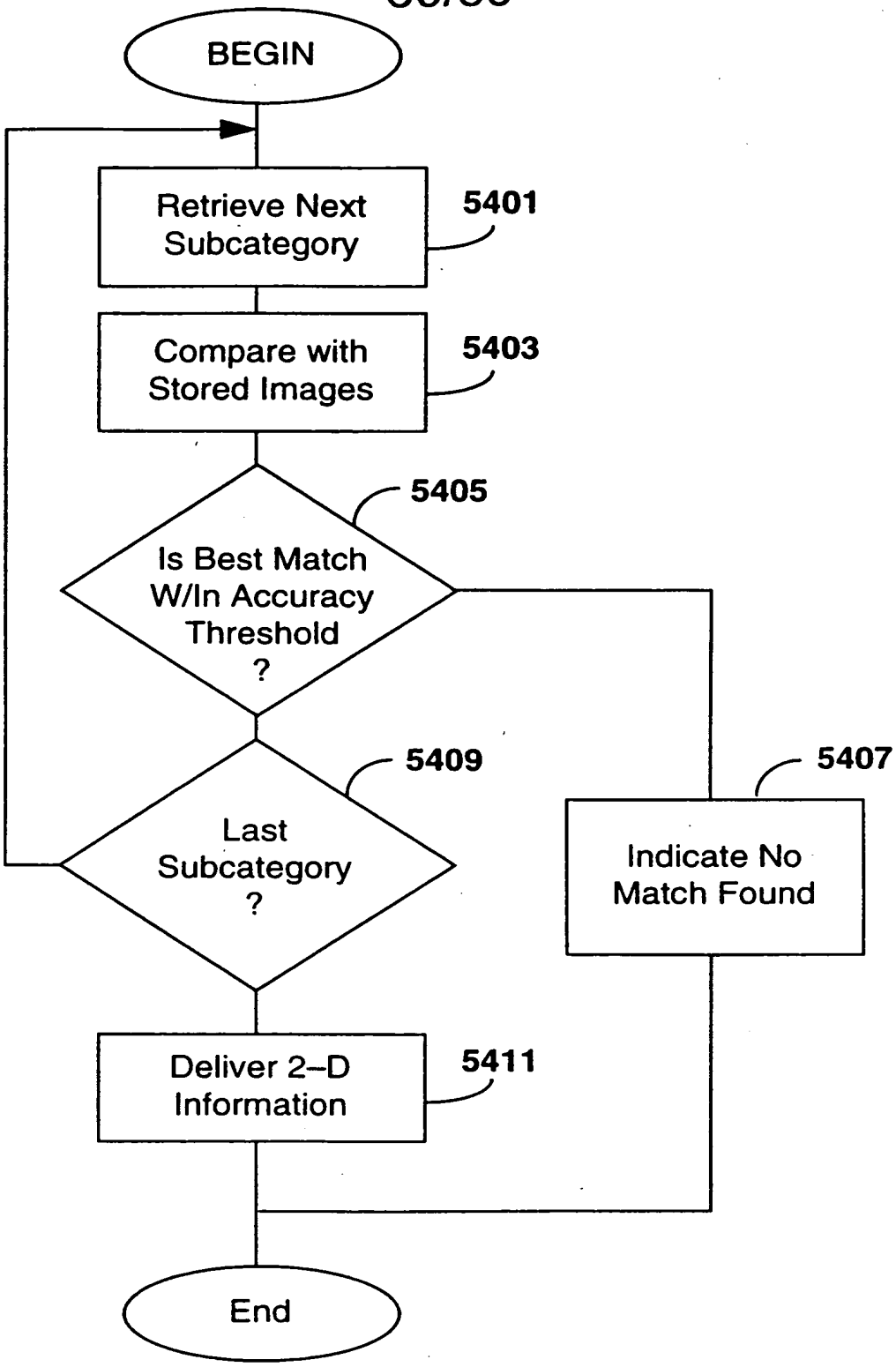

BEGIN
Retrieve Next Subcategory
5401
Compare with Stored Images
5403
5405
Is Best Match W/In Accuracy Threshold ?
5409
Last Subcategory ?
5407
Indicate No Match Found
Deliver 2–D Information
5411
End

Figure 54

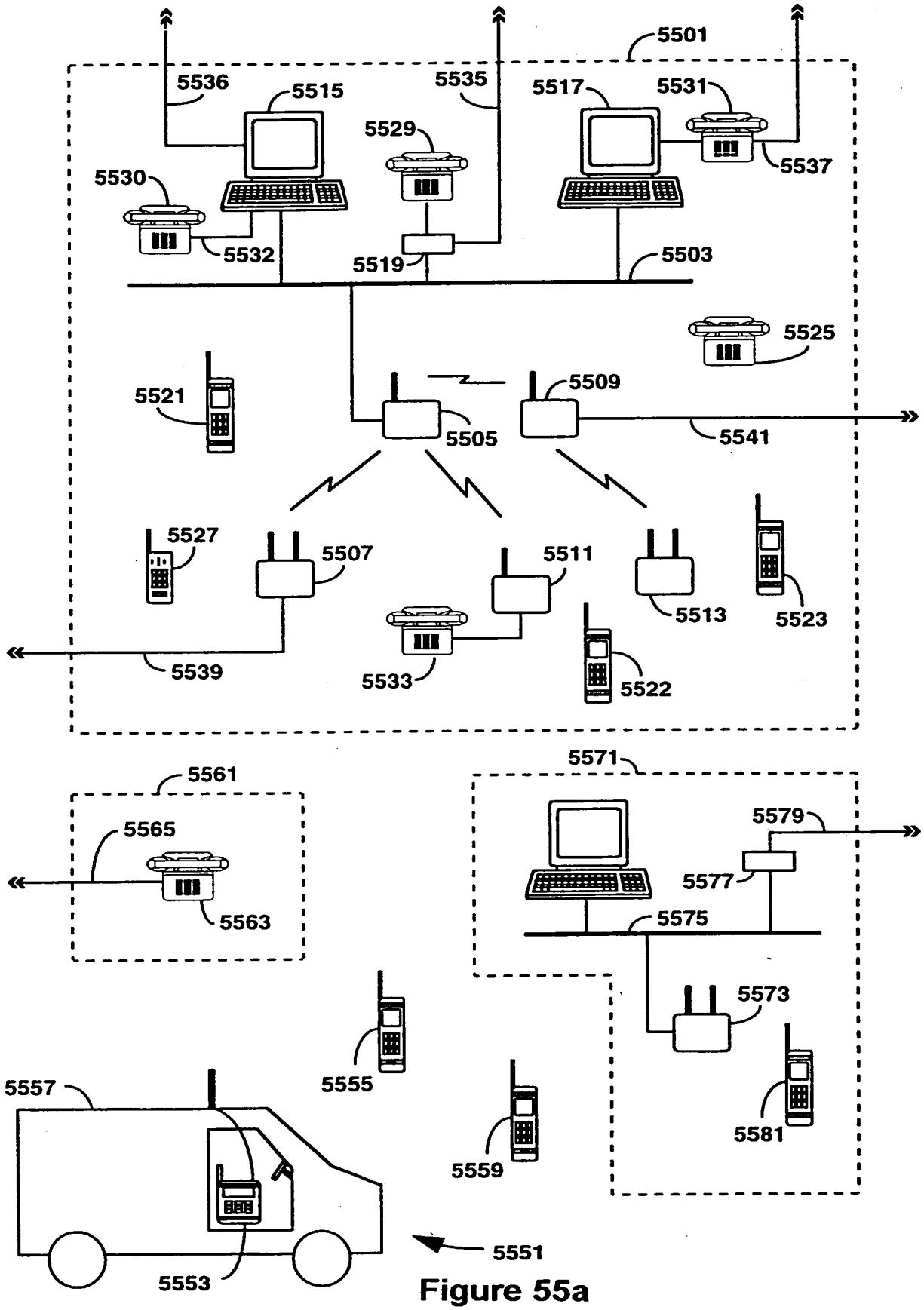

5501
5536
5515
5535
5517
5531
5529
5530
5537
5532
5519
5503
5525
5521
5509
5505
5541
5527
5507
5511
5513
5523
5539
5533
5522
5561
5565
5571
5579
5563
5577
5575
5573
5555
5581
5559
5557
5551
5553

Figure 55a

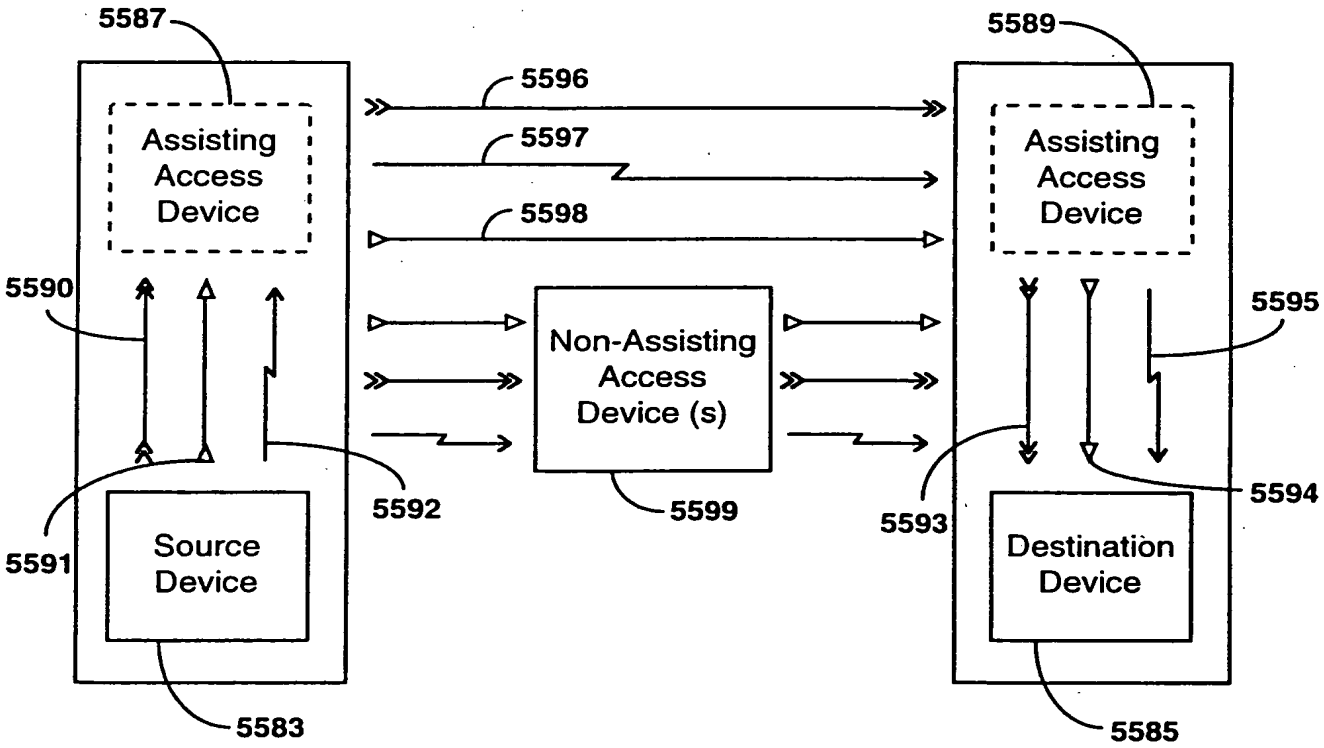

5587
Assisting Access Device
5590
5591
Source Device
5583
5592
5596
5597
5598
Non-Assisting Access Device (s)
5599
5589
Assisting Access Device
5595
5594
5593
Destination Device
5585

Figure 55b

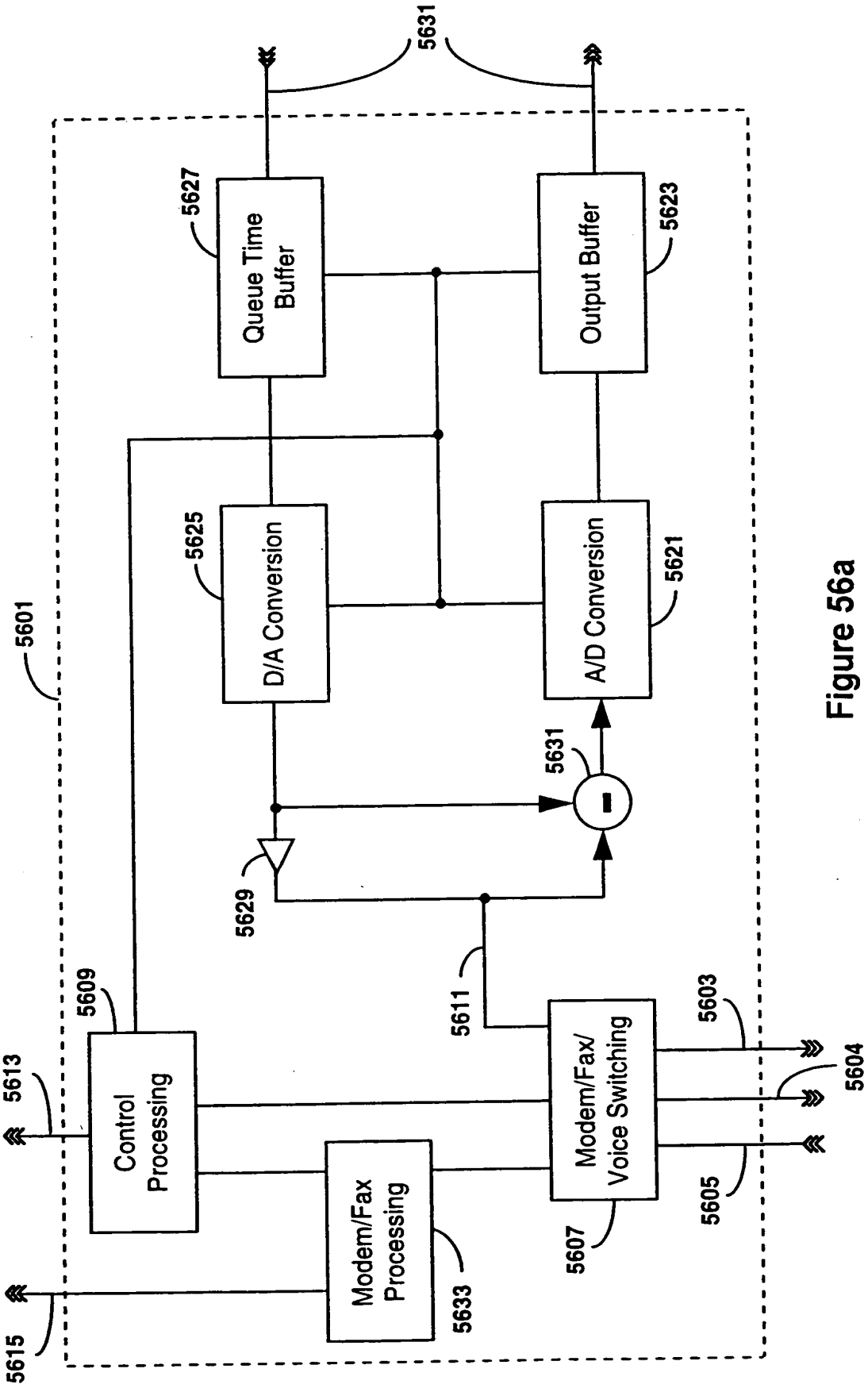

5631
5627
Queue Time Buffer
Output Buffer
5623
5625
D/A Conversion
A/D Conversion
5621
5601
5631
5629
5609
5611
5603
5613
Control Processing
Modem/Fax/ Voice Switching
5604
Modem/Fax Processing
5605
5607
5633
5615

Figure 56a

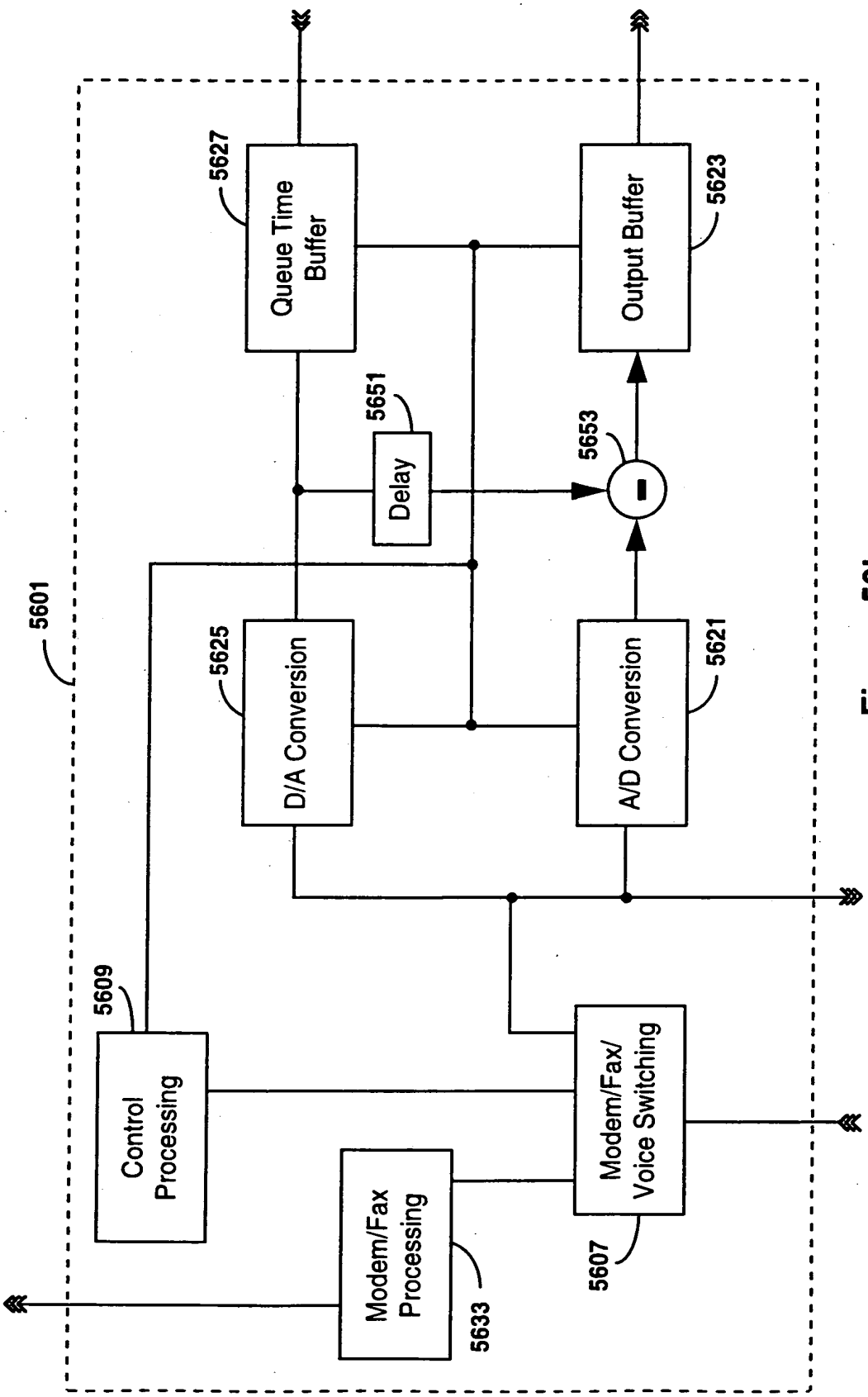

5601
5627
Queue Time Buffer
5623
Output Buffer
5651
Delay
5653
5625
D/A Conversion
5621
A/D Conversion
5609
Control Processing
Modem/Fax Processing
5633
Modem/Fax/ Voice Switching
5607

Figure 56b

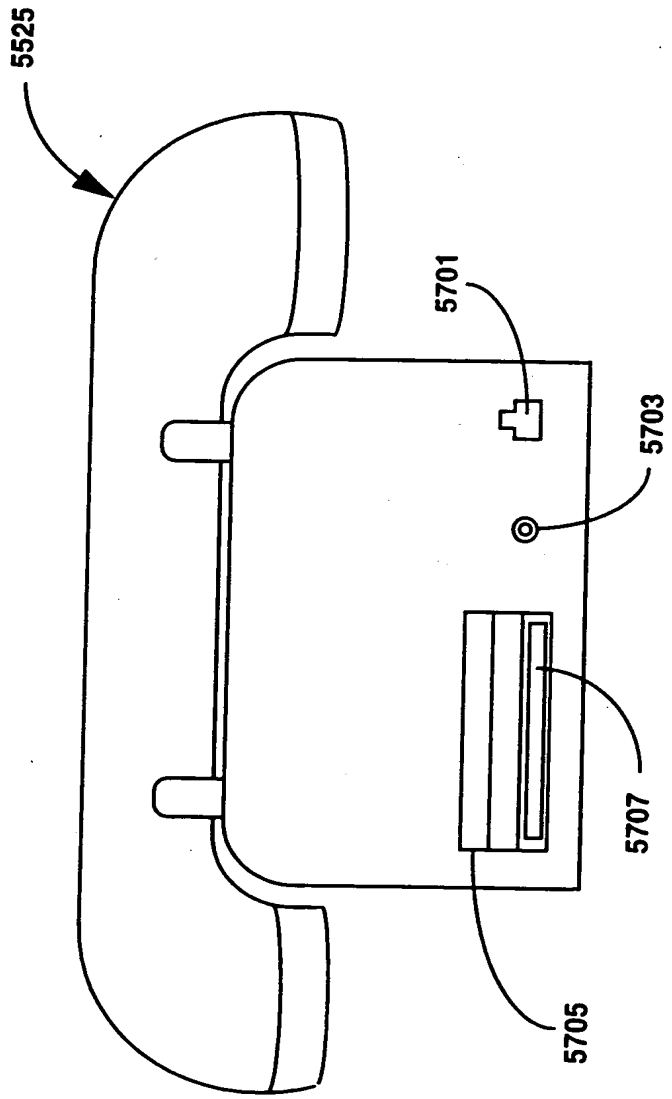


Figure 57

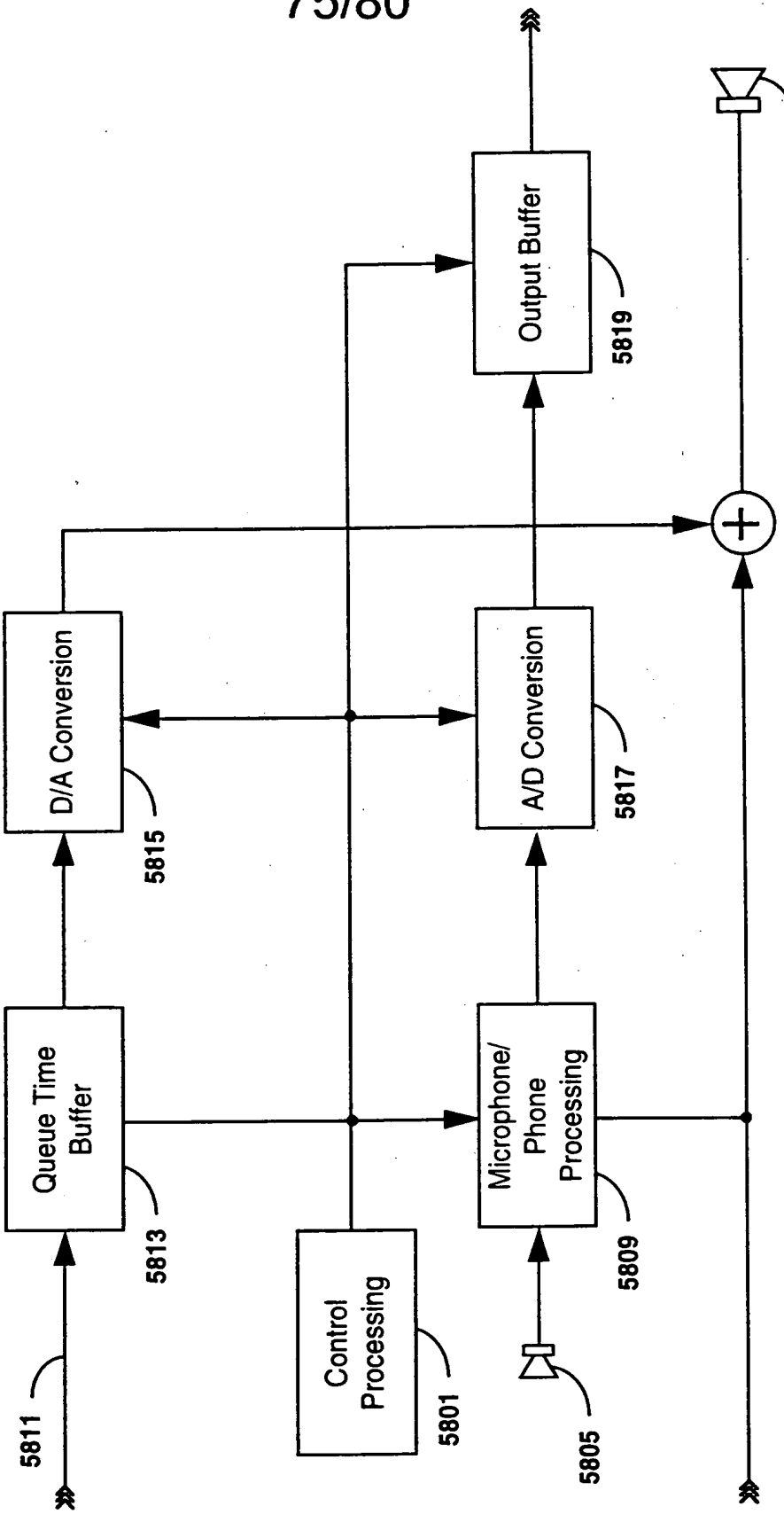

5811
Queue Time Buffer
5813
D/A Conversion
5815
Control Processing
5801
Microphone/ Phone Processing
5809
A/D Conversion
5817
5805
Output Buffer
5819
5807

Figure 58

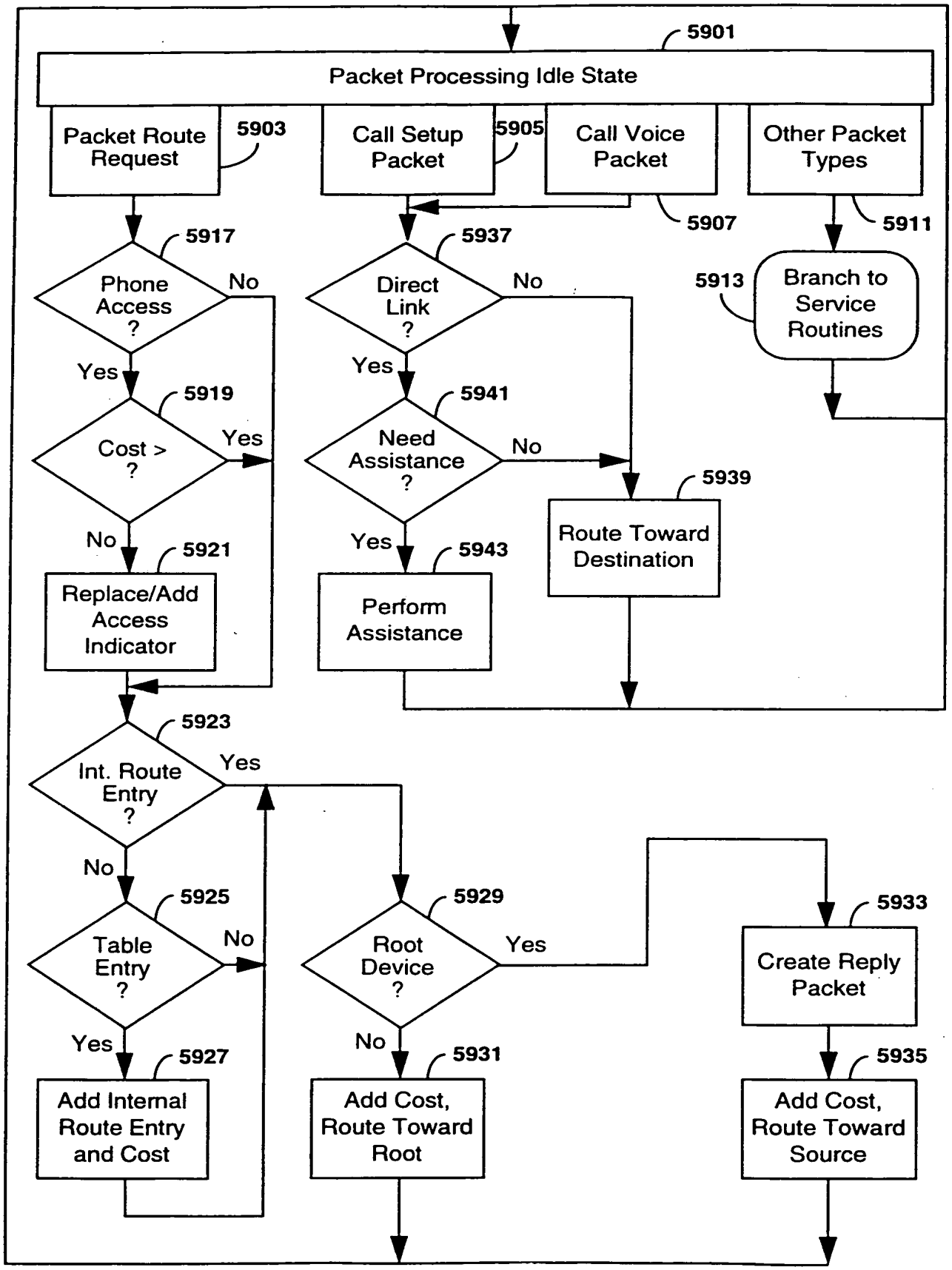

5901
Packet Processing Idle State
Packet Route Request
5903
Call Setup Packet
5905
Call Voice Packet
Other Packet Types
5907
5911
5917
Phone Access ?
No
Yes
5919
Cost > ?
Yes
No
5921
Replace/Add Access Indicator
5937
Direct Link ?
No
Yes
5941
Need Assistance ?
No
Yes
5943
Perform Assistance
5939
Route Toward Destination
5913
Branch to Service Routines
5923
Int. Route Entry ?
Yes
No
5925
Table Entry ?
No
Yes
5927
Add Internal Route Entry and Cost
5929
Root Device ?
Yes
No
5931
Add Cost, Route Toward Root
5933
Create Reply Packet
5935
Add Cost, Route Toward Source

Figure 59

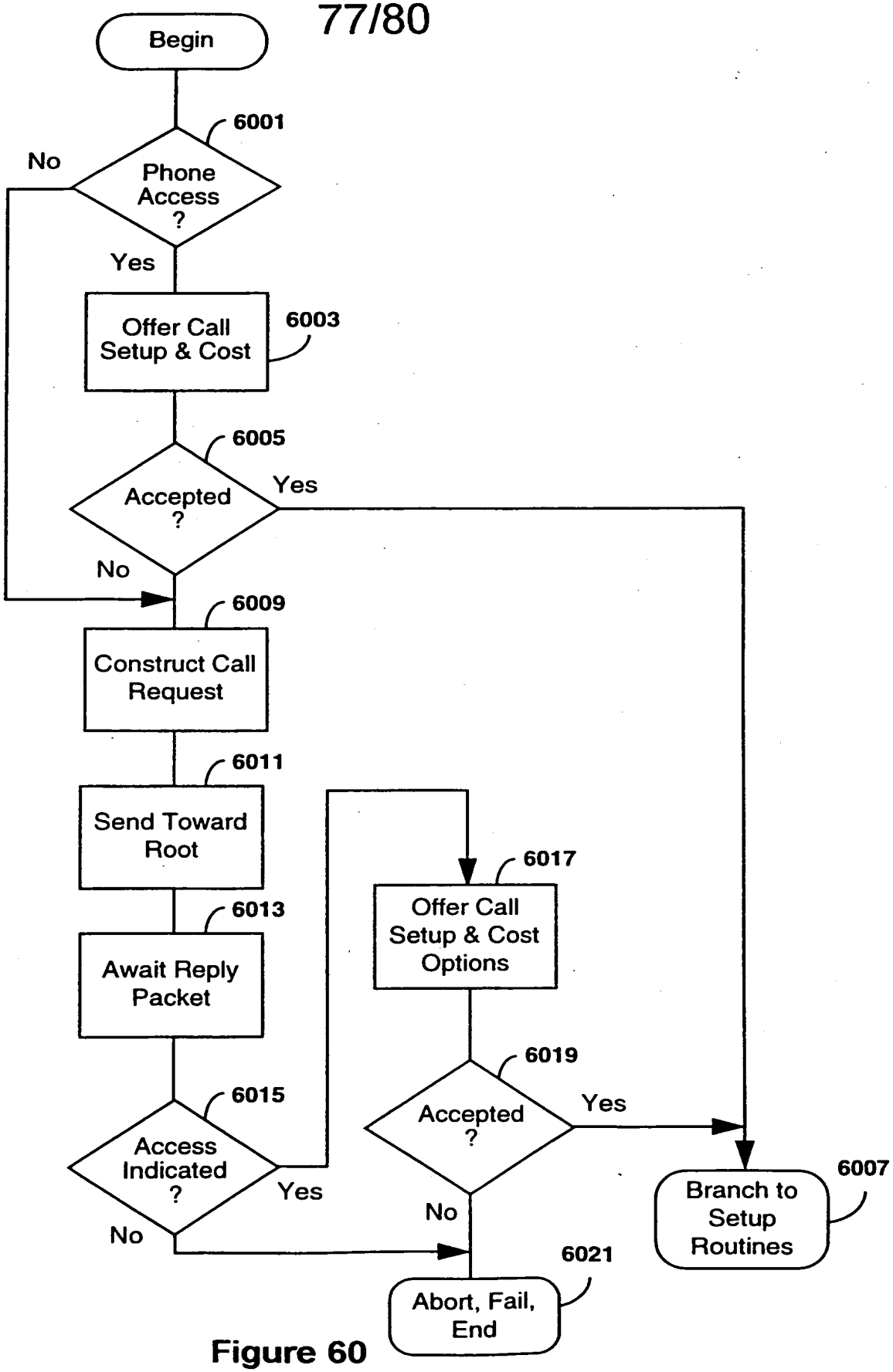

Begin
6001
Phone Access ?
No
Yes
Offer Call Setup & Cost
6003
6005
Accepted ?
Yes
No
6009
Construct Call Request
6011
Send Toward Root
6013
Await Reply Packet
6015
Access Indicated ?
Yes
No
6017
Offer Call Setup & Cost Options
6019
Accepted ?
Yes
No
6007
Branch to Setup Routines
6021
Abort, Fail, End

Figure 60

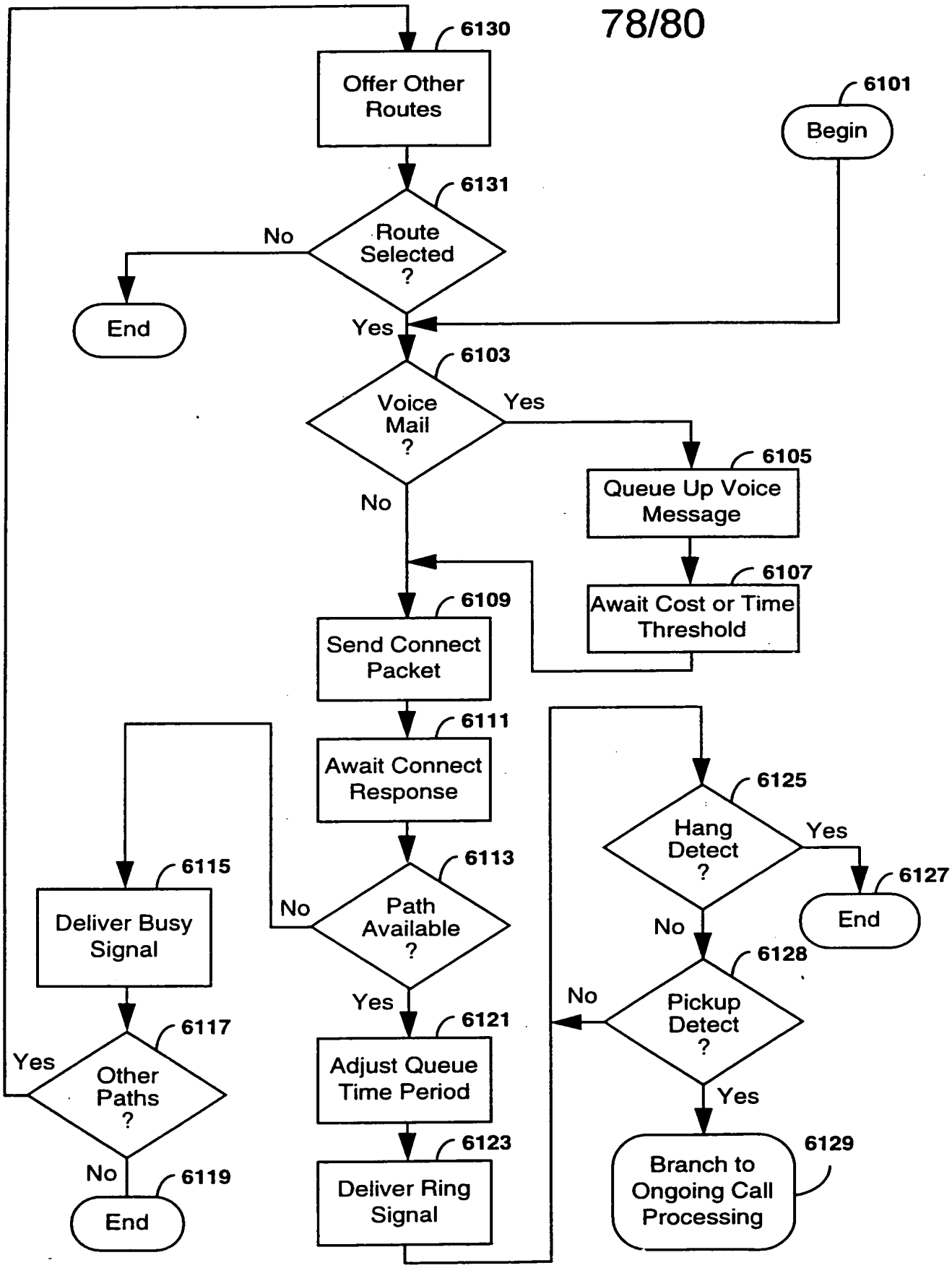

6130
Offer Other Routes
6101
Begin
6131
Route Selected ?
No
End
Yes
6103
Voice Mail ?
Yes
6105
Queue Up Voice Message
No
6107
Await Cost or Time Threshold
6109
Send Connect Packet
6111
Await Connect Response
6125
Hang Detect ?
Yes
6127
End
6113
Path Available ?
No
6115
Deliver Busy Signal
No
6128
Pickup Detect ?
No
Yes
6117
Other Paths ?
Yes
6121
Adjust Queue Time Period
6123
Deliver Ring Signal
6129
Branch to Ongoing Call Processing
No
6119
End

Figure 61

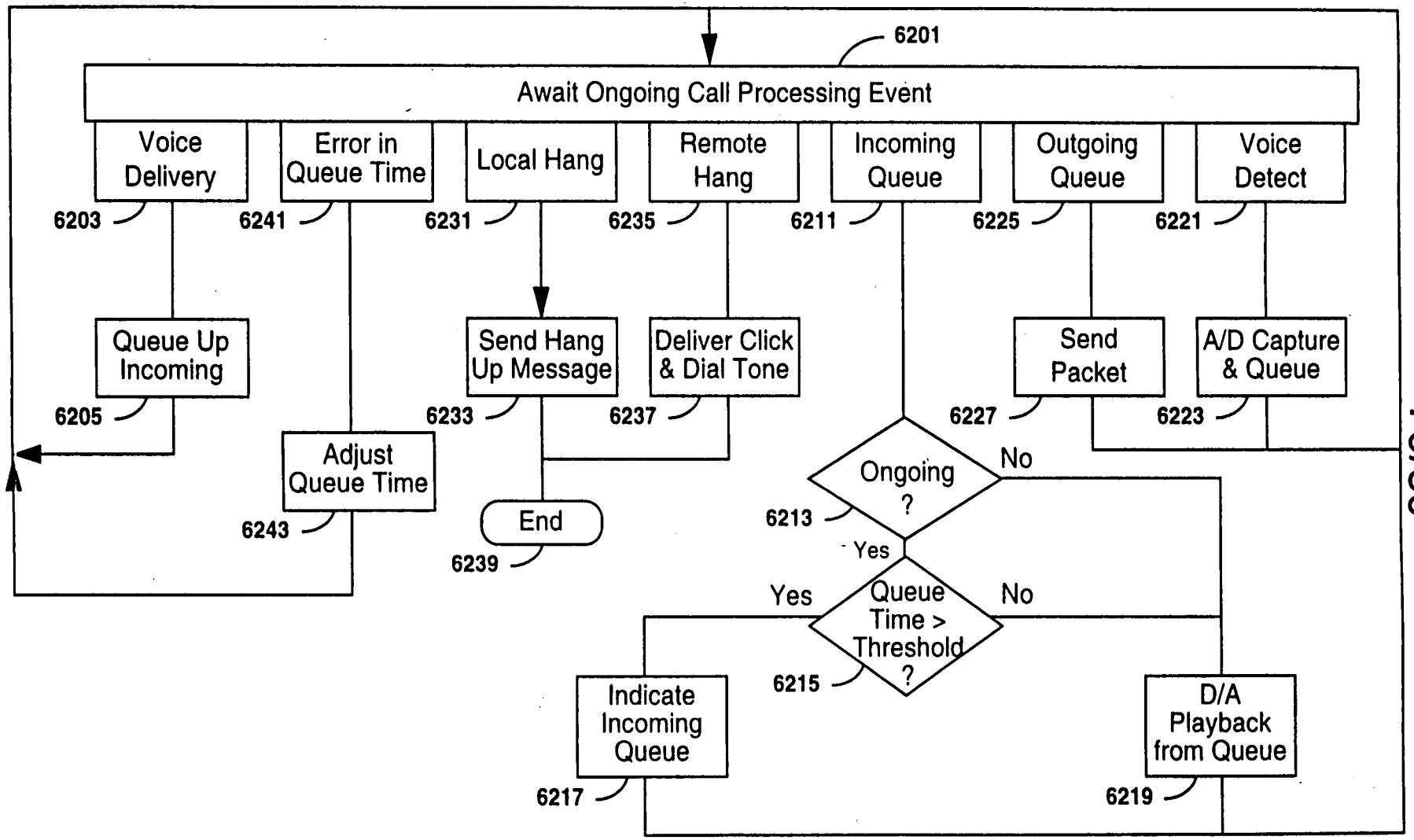

6201
Await Ongoing Call Processing Event
Voice Delivery
6203
Error in Queue Time
6241
Local Hang
6231
Remote Hang
6235
Incoming Queue
6211
Outgoing Queue
6225
Voice Detect
6221
Queue Up Incoming
6205
Send Hang Up Message
6233
Deliver Click & Dial Tone
6237
Send Packet
6227
A/D Capture & Queue
6223
Adjust Queue Time
6243
End
6239
Ongoing ?
6213
No
Yes
Queue Time > Threshold ?
6215
Yes
No
Indicate Incoming Queue
6217
D/A Playback from Queue
6219
79/80

Figure 62

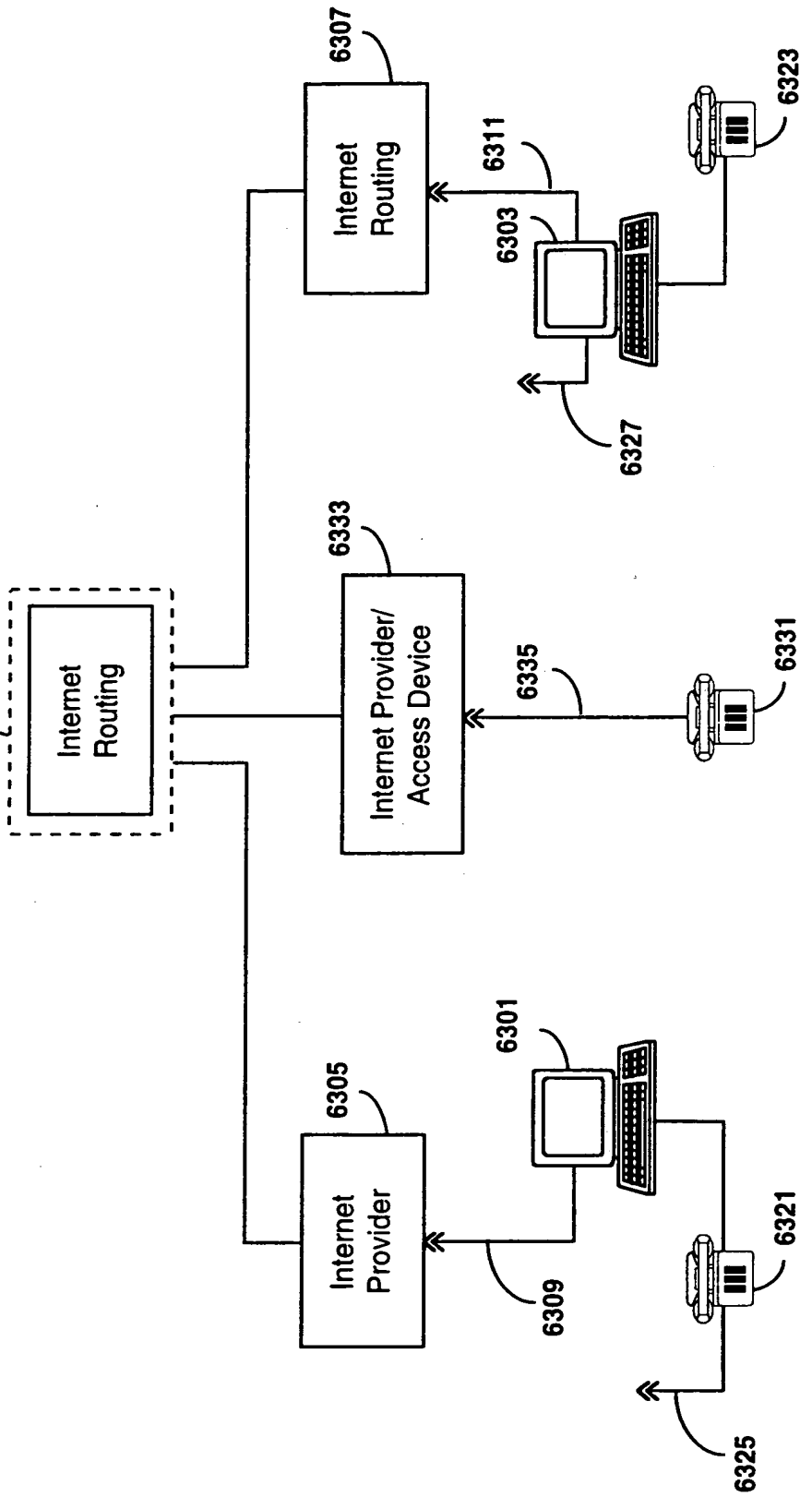

6307
Internet Routing
6311
6323
6303
6327
6333
Internet Provider/ Access Device
6335
6331
6315
Internet Routing
6301
6305
Internet Provider
6309
6321
6325

Figure 63